ELECTRICAL REVIEW

[ILLUSTRATED.]

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A New Magneto Bell.

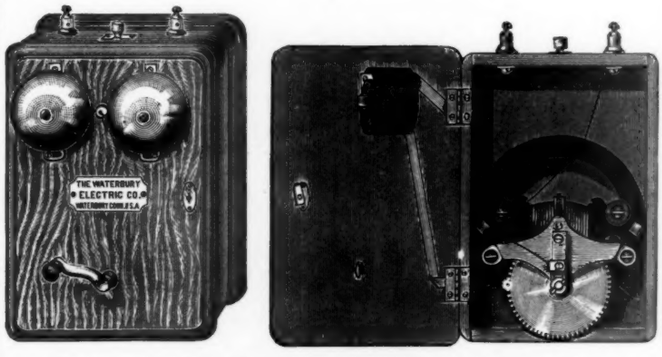
The Waterbury Electric Company, of Waterbury, Connecticut, have brought out a new magnetic call bell, which is a departure from the usual style and has several new and novel points about it. The principal advantages which they claim for it are its simplicity and compactness, and consequent non-liability to get out of order—all the parts of the generator being mounted on the steel magnets, so that it cannot get out of order by any warping or changing of the box. As will be seen by the illustration the field is composed of four circular steel magnets with segmental pole pieces, which, with a peculiar process which they have of magnetizing them, makes a very powerful magnet, and concentrates the line of force almost entirely through the armature. The armature is what is known as the double T or a modification of the Siemens. The handle has an exceedingly simple and effective arrangement which cuts the generator in automatically when it is turned.

The bell movement is also very compact and simple, using a single spool and utilizing both poles. The armature is polarized by induction from the circular magnet which surrounds it. They also make a powerful little testing bell arranged with the bells on top and a strap for convenience in carrying.

A New Method of Protecting Iron.

M. Ade Meritens, electrician, has brought out a new method of protecting iron. The article to be protected is placed in a bath of ordinary or distilled water, at a temperature of from 70° to 80° C. (158° to 176° F.) and an electric current is sent through. The water is decomposed into its elements, oxygen and hydrogen, and the oxygen is deposited on the metal, while the hydrogen appears at the other pole, which may either be the tank in which the operation is conducted or a plate of carbon or metal. The current has only sufficient electromotive force to overcome the resistance of the circuit and to decompose the water, for if it be stronger than this the oxygen combines with the iron to produce a pulverulent oxide which has no adherence. If the conditions are as they should be, it is only a few minutes after the oxygen appears at the metal before the darkening of the surface shows that the gas has united with the iron to form the magnetic oxide, which it is well known will resist the action of the air and protect the metal beneath it. After the action has continued an hour or two the coating is sufficiently solid to resist the scratch brush, and it will then take a brilliant polish. The depth of penetration is shown by the following fact. A gun barrel was oxidized, and then the magnetic coating was completely removed by emery, until the surface again became white. It was again returned to the bath, and immediately on the passage of the current the black color again reappeared. If a piece of thickly rusted iron be placed in the bath, its sesquioxide is rapidly transformed into the magnetic oxide. This outer layer has no adhesion, but beneath it there will be found a coating which is actually a part of the metal itself.

In the early experiments with this process M. de Meritens employed pieces of steel only. But when he turned to objects in wrought and cast iron he found that he no longer was successful, for the coating was not fast and came off with the slightest friction. After many trials with currents of different electromotive force he reversed the order of affairs, and placed the iron at the negative pole of the apparatus after it had been already applied to the positive pole. Here the oxide was reduced, and hydrogen was accumulated in the pores of the metal. The specimens were then returned to the anode, when it was found that the oxide appeared quite readily and was very solid. But the result was not quite perfect, and it was not until the bath was filled with distilled water in place of that from the public supply that a perfectly satisfactory result was attained. The process, it will be seen, is perfectly simple, and demands but little skill in its execution. Now that dynamo machines have superseded batteries as sources of electricity, all that is required is a tank, a quantity of distilled water and a little power to drive the machine. By placing a number of baths in series, and increasing or diminishing their number, the electromotive force of the current can be regulated without any arrangements of artificial resistance.



FIGS. 1 AND 2.—NEW MAGNETO BELL—EXTERIOR AND INTERIOR VIEWS.

Penetrative Power of Light.

If it were possible to rise above the atmosphere which surrounds the earth we should see nothing but an intense and sharply defined ball of fire, while everything else would be wrapped in total darkness. There could be no diffusion of light without an atmosphere or some similar medium for it to act upon; but if the air around us extended to a height of 700 miles, the rays of the sun could not penetrate it, and we would be left in darkness. At the depth of 700 feet in the ocean the light ceases altogether, one-half of the light being absorbed in passing through seven feet of the purest water.

—— Mr. Lawson has closed a contract with the Stormont Cotton Company, Montreal, for the lighting of their mill at Cornwall, by 735 Edison lights of 16-candle-power. This makes the total number of these lights sold in Canada since the middle of July 2,200.

Opening of the Electric Club Rooms.

The first regular meeting of the Electric Club, in their new rooms in the Hotel Dam, was held last Thursday evening, October 7. The occasion was a particularly pleasant one, the members dining together informally. Among the non-resident members present was Mr. A. J. De Camp, of Philadelphia, chairman of the Executive Committee of the National Electric Light Association. The Committee on Entertainment reported that an address would be delivered at the next regular meeting, November 4, by Dr. Geo. H. Benjamin, of this city.

The names of twelve new members were reported favorably from the Committee on Membership, and unanimously elected members by the Board of Managers.

All who were present expressed themselves as pleased with the permanent club rooms secured for the club. These rooms are open at all hours for members and their electrical guests. Thursday evening will be the occasion of informal gatherings of the Board of Managers, and on those evenings each week it is desired that all members attend who can conveniently do so.

Surveying by Electric Light.

M. Otto Chrismar, a professor at Schemnizt, in Hungary, has applied the incandescent lamp as fed by accumulators to facilitate surveying operations in ill-lighted mines, by means of the theodolite or level. A magnetic compass might, of course, be influenced by the currents. Two lamps are employed, one large to light the angle to be taken and a miniature one to light the vernier. We need not enter into the details of these lamps or of the accumulators and the connections; but it may be mentioned that two separate accumulators are employed, both portable. One of these goes along with the larger lamp, and the other with the smaller lamp and instrument. While upon this subject we may add that a French engineer recently made an equally interesting application of the incandescent lamp to a boring appliance. Some time ago an underground gallery closed in, and some miners were entombed. In order to ascertain their fate, if possible, and see what had taken place in the cavity where they were, a set of incandescent lamps were designed so as to go down into the cavity along with a bore rod from above. Besides these lamps a photographic apparatus also accompanied the rod. Conductors carried the current inside the hollow rod, and the lamps and camera were operated from above. The result was some photographs of the interior, showing the débris of the cavity, and amongst it the dead body of a miner partially buried in the earth.

Listening on the Telephone Line.

On one of the telephone circuits in the western part of the city of Detroit, where four subscribers use the same line, one of them was called up the other day by a second on a matter of business.

"You say you paid $2 per yard!" queried the first.

"No, I didn't say exactly."

"But my wife wants to know. Give me the exact figures."

"I will the first time I see you."

"But why not now?"

"Because Mrs. L., who is on the line, is always listening at her telephone to hear what the rest of us say, and my wife doesn't want her to know."

"Oh, that's it. I thought you might be afraid of Mrs. B. That's one of her tricks, too, though I guess both of 'em are away to-day. Good-bye."

"Hold on there!" called a voice as the trumpets were about to be lowered. "I am Mrs. L., and I want to tell both of you men that you state a deliberate falsehood when you say I listen! You are no gentlemen, and my husband shall make you apologize."

"And hold on some more!" called a second voice. "I am Mrs. B., and any one who says I listen to other people's talk has got to prove it in court! Make up your minds to hear from me!"

Four trumpets were carefully lowered from four ears and hung up on four telephone boxes, and deep silence brooded o'er the land where Jackson runs the telephone business.

Firing Steam Boilers.

There is a very simple way of firing, which answers very well, and which does not require complicated constructions and appliances, always more or less objectionable.

It depends upon the following considerations: When fresh coal is charged upon incandescent fuel, as is the case in the usual mode of firing boilers, the volatile gases of the fresh fuel are rapidly evolved, filling the fire-box to such an extent as to prevent the ingress of air through the grate, and this occurs at the very time the air supply should be considerably increased. The result is imperfect combustion, and consequent waste of the very best combustible gases, viz., the hydro-carbons, which cannot burn for want of air to combine with; free carbon is thus liberated from these gases, and smoke is produced. In order to avoid smoke, and consequent loss of fuel, any sudden production of volatile gases, either during or after firing, must be prevented; and sufficient air should always be introduced, and so distributed, as to burn those gases as quickly as they are produced. This can be done in the following manner:

Before putting on fresh coal, the burning fuel should be pushed back from the front part of the grate, and distributed on the incandescent fuel behind, care being taken that this portion of the grate is entirely free from hot fuel. When the front part of the grate has become comparatively cool, owing to the air passing through it, fresh coal is distributed thereon. The freshly-charged fuel lying on the cool grate, with cold air passing through it, will be heated by radiation only—partly the flame from its own gases, and partly by the surrounding hot brick-work. The volatile gases will consequently be liberated at a comparatively slow rate, and will combine with the air, which, entering through the interstices in the fuel on the cool part of the grate, will be evenly distributed over its surface.

Gas and air will thus be supplied in nearly the proper proportions for complete combustion of the fuel, and as the production of volatile gases diminishes, the air passing through the front part of the grate will enter into combustion with the fuel thereon, which has been deprived of nearly all its volatile constituents.

By means of this simple method the sudden production of a large volume of volatile gases is avoided, and air in a well-divided state is always present to consume the gases liberated; thus smokeless combustion and saving of fuel are realized. Care must be taken that the fresh fuel is charged at regular intervals of time and in equal quantities.—*Extracts from a letter written by Frederic Siemens, of Dresden, Saxony, to Dr. Geo. H. Benjamin, of New York.*

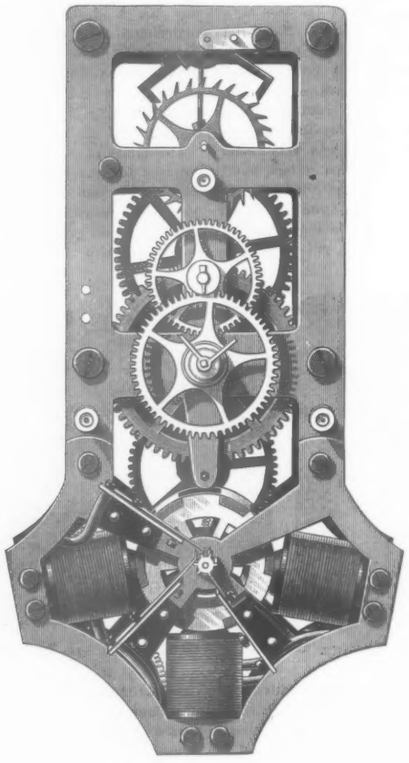
Electric Motors.

Mr. W. M. Mordey showed an electric motor phenomenon which startled the section of the British Association, says *Engineering*, almost as much as it shook the Brush motor, which was employed in the experiment. The phenomenon was discovered accidentally. A series-wound machine—a 30 horse-power motor—was started by a large Brush machine acting as generator; the motor ran slowly, and developed but little power. As there was apparently some fault, the motor had to be stopped by taking one of the leads from the driving generator out of its terminal. The motor stopped suddenly, but instantly started running again backwards for a little while. An examination revealed that the fields of the motor, instead of being joined in series with the armature, had by mistake been placed as a shunt across it. The experiment was shown to the section, and repeated by desire of some of its influential members. The motor ran first at high speed, then slowly after the shunt had been effected; and when the generating current was broken, it came to a stop instantaneously, being almost thrown over. It then made a few turns backward. When a motor is running, its electromotive force is, as it were, trying to send a current in the opposite direction to that which is being forced through its armature. On cutting off the supply current, this opposing electromotive force is able to assert itself, and the motor becomes converted into a generator. The momentum of the armature keeps up the motion for a certain time, and causes the armature to generate a current which circulates through the armature and field. In fact, the shunt motor, under these conditions, acts like a series-generator with its terminals short-circuited. The momentum of the armature, and of the machinery connected with it, becomes quickly exhausted, and the armature comes to rest.

The Brush motor which accidentally displayed this phenomenon, has been working for several months very successfully in New Zealand, at the Phœnix Gold Mines. The current is generated by Brush dynamos, driven by water-power, and conducted to the motor by means of an ordinay copper wire, 0.165 inch in diameter, carried on poles; the length of conductor is six miles. The effective useful return is over 65 per cent., a very satisfactory result for an installation in the mountains of a remote colony, where skilled labor is neither available nor required.

Taking Portraits by Electricity.

The *English Mechanic* contains the following directions as to how to take good portraits by electric light with but very little expense. There are hundreds of people of the working classes who want photographs, but cannot afford to lose half a day in order to have them taken. I resolved to take photographs at night, and at once set to work to construct and build an apparatus for the purpose, which in time proved to be so thoroughly practical and gave me such excellent results, at the same time involving but little expense, that I decided to give a description of it, through the columns of this journal, for the benefit of others who may be interested in this line. It may as well be mentioned that it will be only of practical value in such places where there is an electric light plant in existence to illuminate the town or city; besides this, small as the investment is, it would not be advisable to open an electric light studio, except in towns or States where all galleries are closed on Sundays; but in such places it will not only pay well, but at the same time prove the most effective advertisement for business that can be desired.



Self-Winding Clock.

The first step to be done was to make an arrangement with the electric light company, the superintendent of which took quite an interest in the matter, and treated me very liberally. The regular charges the company made for supplying an arc light of somewhat over 2,000 candle-power, burning until 10 o'clock P. M., were 10 dollars per month, or about 40 cents a night, the company furnishing the lamps and carbons and putting in the wires. In my particular case, and because I was in possession of my own electric automatic focusing lamp, they charged me 40 cents a night, and only on such nights when I used the light and made negatives; so there was absolutely no risk for me. This advantage can, of course, not be expected everywhere. To build an apparatus for lighting the sitter properly, I proceeded as follows: I first constructed a platform 4 feet long, 2 feet wide, 5 inches high, traveling on large casters. On one end of this platform was erected a sort of stand or framework, consisting of four corner pieces, made of strips 4½ feet high, 3 inches wide, 1 inch thick. These strips were screwed against the sides of the platform about 6 inches apart, on the top, and in the center of these corner pieces were fastened four other strips to form a framework and to give the whole strength. I then fastened in the center of each frame a cross piece with a ½ inch round hole in the center, through which a long head-rest rod could be slipped, and raised and lowered to any desired height.

In order to adjust the height, a cast-iron collar or ring was attached to the rod, to be fastened with a set screw. This ring rested on one of the cross pieces—thus the rod could be easily revolved. The top of the rod was provided with a cross piece of an old head-rest, through which another head-rest rod was passed crosswise, which could be raised or lowered to any desired angle. The end of this smaller rod carried the large reflector used for lighting the sitter. To make this reflector, I had first a wooden disk or center piece made by a wood-turner, about 6 or 8 inches in diameter, and turned slightly hollow or curved inside. In the inner surface of this disk I then fastened with small screws eight ribs or sticks made of hickory wood, each 3 feet long, about ½ inch wide, and ¼ inch thick, at equal distances. On the end of each rib was screwed a small screw-eye. A string was then passed through all the screw-eyes and pulled together to make the sticks bend and form a curve of about 1½ feet deep from the center, the whole looking like the framework of a huge umbrella. The sections of this framework were then covered with pieces of stout cardboard (No. 1). These were fastened alongside the ribs with small tacks; afterward strips of muslin were glued over the seams inside and outside. The cardboard next received a good sizing with glue or gelatine, then one or two coats of paint, outside dark and inside white; at last the inside was twice coated with the best white kalsomine, giving a perfect white and dead surface. The reflector measured about 5½ feet in diameter, being about 1½ feet deep. On the front part of the platform, right in front of this reflector, was fastened another head-rest simply by means of skate straps. This carried my electric lamp. In case a regular street arc lamp is to be used, a sort of wooden stand must be constructed to carry the same, so that it can be raised or lowered. Any ordinary carpenter can make the whole apparatus for a few dollars, and all the ironwork consisted of old head-rests lying around loose in the gallery. The wires in the room that connected the lamp with the electric circuit must be so-called flexible wires, to allow the whole machine to be freely moved about in the room. These wires consist of a number of thin, soft wires enwrapped in the insulating material.

In order to protect the sitter from the direct rays of the arc light, and at the same time to diffuse the light properly so that no harsh or cast shadows appear in the pictures, I employed, after many experiments, the following device, which I claim to be novel, and believe to be better than anything else heretofore employed for the same purpose. I made a light octagon frame of about 8 inches in diameter. Into this was fitted one sheet of white opal glass and another of clear blue glass—both were fastened in the frame, the opal glass towards the reflector and the blue glass towards the sitter, and the frame fastened in front of the arc light. This completed my apparatus, which could now be easily wheeled around, and enables me to change the light on the sitter from right to left at a moment's notice, without the necessity of making the sitter change his position, or moving the head rest or any of the accessories. On both sides of the background, and running on stretched wires, which were fastened on screw-eyes screwed into the wall of the room, I employed two large curtains of white muslin (light blue or gray may perhaps be better) provided with rings. I also used a white curtain on the ceiling above the head of the sitter. These and an ordinary reflector or side screen were all the means employed for lighting. By using a quick-working lens, second stop, I made with extra quick plates good cabinet negatives in about five seconds. After a few evenings' practice I succeeded in managing the light so well that even expert photographers could not tell my pictures from those taken with daylight, and frequently expressed their disbelief, doubting that they were taken at night. In writing this article, it was not my intention to teach photographers anything new or highly interesting, but simply to give to those interested in this line a few practical hints how they can take good pictures by electric light without investing a large sum in an expensive apparatus and plant, which is generally estimated to cost from £400 to £600 in the United States.

Self-Winding Clocks and Regulators.

One of the most recent improvements in electrical devices for winding clocks has just been brought out by Messrs. C. H. Pond & Co. of this city. One advantage in its use is that it is entirely self winding at regular intervals by electricity, thus obviating all the care and attention required in the use of key-winding clocks.

The principle of frequent and regular winding not only shortens the "train," but decreases the friction and strain upon it to the lowest degree.

This system does away with all necessity for use of a "maintaining power" as the spring is wound in the same direction the "train" is moving, thus maintaining a perfect uniformity of tension which all horologists admit is of the greatest importance, and without which perfect time cannot be had.

These clocks wind to the same tension every time, and are wound automaticaliy once an hour.

It requires no expert in electrical mechanism to set these clocks running. Any competent watchmaker can do it.

Each clock is supplied with a small battery which may be placed either within the clock, or in any other convenient location.

The battery used is of the most simple character and may be renewed when necessary, by any one of ordinary intelligence, without previous experience or instruction.

The action required of the battery is so slight that it performs its work of winding the clock for over one year without renewal or attention.

Electric Light Test.

Editors Electrical Review:

GENTLEMEN—The following letter from Mr. C. H. Atkins explains itself:

"BOSTON, Mass., Aug. 27, 1886.

"The Waterhouse Electric and Manufacturing Company.

"Dear Sirs: In compliance with your re-

quest to make an accurate and reliable test of the horse-power required to operate the Waterhouse system of electric arc lighting, I have to submit the following report.

"The plant tested was at the local electric lighting station in Hartford, and comprised two Waterhouse dynamos in series, running forty-six lights (full arc) on a seven-mile circuit, and driven by an Armington & Sims engine of nine and one-half inches diameter of cylinder by twelve inches stroke, running 284 revolutions per minute. The instruments employed for making the test were a pair of Thomson's steam engine indicators, using the pantograph for the reducing motion.

"The first test was made to determine the amount of power consumed in friction of engine and dynamos, without brushes or commutators, and which resulted 4.88 horse-power. Diagrams were then taken every five minutes for one hour, with full load on, all lights in circuit, and the total result averaged 31 50 horse-power developed. Deducting the 4.88 horse-power friction leaves 26.62 horse-power required to operate the 46 lights, being nearly .58 horse-power per light.

"The engine with this number of lights has too light a load for economy, a mean effective pressure of only 26.18 lbs. being realized, while, with same boiler pressure, cutting off at one-quarter stroke, the mean of effective pressure would be 47 lbs. In our opinion nearly double the number of these lights could be run by this engine, with a slight decrease in the power required per light.

(Signed) "Yours truly,

"C. H. Atkins,

"With Knowles Steam Pump Works."

While the tests were being made every five minutes for each hour, we took a like record at same time of the current as indicated by an Ayrton & Perry ammeter, resulting in an average of 9.44 amperes, showing the lights well up to the 2,000 candle-power standard, lamps burning long arc, 4.5 ohms resistance. As a further proof of the diffusive powers of the lights, the center line of shadow was determined between the Waterhouse light on one pole, and the light of the system heretofore operated by the local company on an opposite pole, which paced 87 steps for the old system and 95 steps for the Waterhouse, from center line to poles. From this test we have an allowance to claim at least that our lights operated on .58 horse-power each, were penetrating as far as the standard 2,000 candle-power lights. The seven-mile circuit of wire has a resistance of three lamps, which counted against us, and the engine working with half a load also was not in our favor, so that we are entirely satisfied that .58 horse-power is an extreme allowance, and that we can record under more favorable circumstances a lower figure.

It can be put down, then, that a 50 horse-power engine cutting off at its most economical point will operate 90 of the Waterhouse full arc lights with a current of 9.44 amperes.

Chas. E. Chapin, Secy.

American Dynamo-Electric Machines.

The Zucker & Levett Chemical Co., of 40 Eleventh avenue, this city are introducing a dynamo for electro-plating that is meeting with favor. The dynamos are made under Muller's patents. Two views of dynamos are given herewith. These are for electro-plating all kinds of metals, the lettering on Fig. 2 being placed on the cut to direct the operator in connecting up.

Prof. T. C. Mendenhall finds that different writers employ a style of remarkable uniformity in the general average of words of different lengths used by them. By counting and tabulating the number of letters in 1,000 or 10,000 words in Dickens, Thackeray and John Stuart Mill, he finds that the results may be graphically represented so as to give a characteristic curve for each author, differing from that for all others. The practical application for these researches might be in deciding the question of the authorship of Shakespeare, which Prof. Mendenhall thinks feasible at an expense of $1,000 or $2,000. In response to a query, he expressed the opinion that prose and poetry of the same author would contain words of the same average length.

Down in the Earth's Interior.

"Talking about earthquakes," said Prof. Van Benthuysen, "calls to mind a question, which, standing alone, is of startling significance to the people of this continent. It is one that has been under discussion for many years, but I believe that the problem was solved when the shock occurred in 1884. The particular place where that earthquake originated affords little room for speculation. The main fact proved by that shock was directly to the point that the interior of the earth is in a highly-heated state.

"There are no facts to disprove this assumption, but many to support it. If it is not in a fluid condition so largely as to interfere with its rigidity, which is counted equal to a ball of steel, this is said to be because of the great weight with which the exterior presses toward the center. Notwithstanding the facts already mentioned, a cooling process is steadily going on. Geologists claim that it has required twenty-five millions of years to acquire its present external form of solidity, and that during this period the mountains were formed and the hollows of the seas made, by a sort of wrinkling of the surface as the globe of liquid fire and heated gases contracted to its present shape. According to this idea, the solid crust of the earth extends down from ten to forty miles, there being beneath that a greater or less thickness of plastic material, from melted rocks, etc., under high pressure, while the crust of the earth is all the time in a high state of tension from the gradual cooling of the interior, causing cavities and allowing the superincumbent earth to crowd down closer to its heated core."

Another theory propounded by the Professor, and one which admits of very little criticism, is to the effect that the access of water, also by percolation from the earth's surface to these subterranean ovens, it is thought, may in some cases cause explosions, dislocating vast quantities of material, and perhaps by opening communication with the still hotter portion yet lower down, be the cause of some of the most destructive volcanoes. These explanations, while being to a small extent hypothetical, accord with all that is known by acknowledged authorities. Another significant point is that they afford the best theory yet advanced to account for the earthquake which is now agitating the minds of people all over the globe. The geologist, waxing warm to his subject, insisted that we have hardly made a pin-scratch upon the crust of the earth. The further we go down the warmer it is. An illustration of this is supplied in the fact that the artesian wells supplying the city of Paris from a depth of nearly 1,800 feet yield water of 82 degrees Fah.; and the lower levels of the Comstock mines have an almost uniform temperature of 130 degrees Fah. It is estimated that the heat increases at the rate of one degree for every fifty feet, and this would give a temperature to melt the hardest rocks in less than ten miles. On this theory the present volcanic and earthquake regions of the globe are located along the axis of those supposed wrinkles or corrugations from the contraction of the crust thought to be at present in the state of greatest tension. The most marked of these are down the east coast of Asia, including the Japan and Philippine Islands, and extending to Java, where the great earthquake of 1883 occurred. Another also extends down the Pacific coast of North and South America, the manifestations of which have been very light in the northern part since the commencement of historic times, but of whose presence in South America we have had many striking proofs.

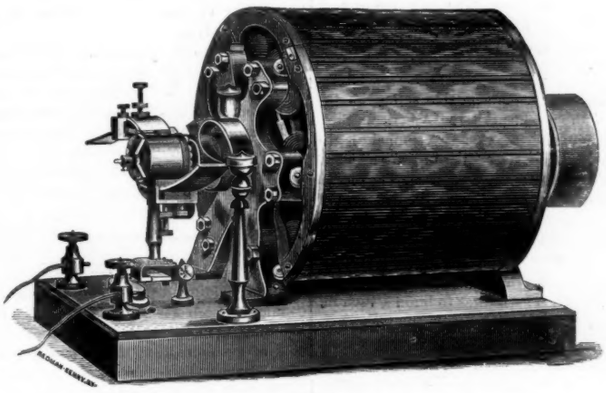


Fig. 1.—Zucker and Levett Dynamo—Muller System.

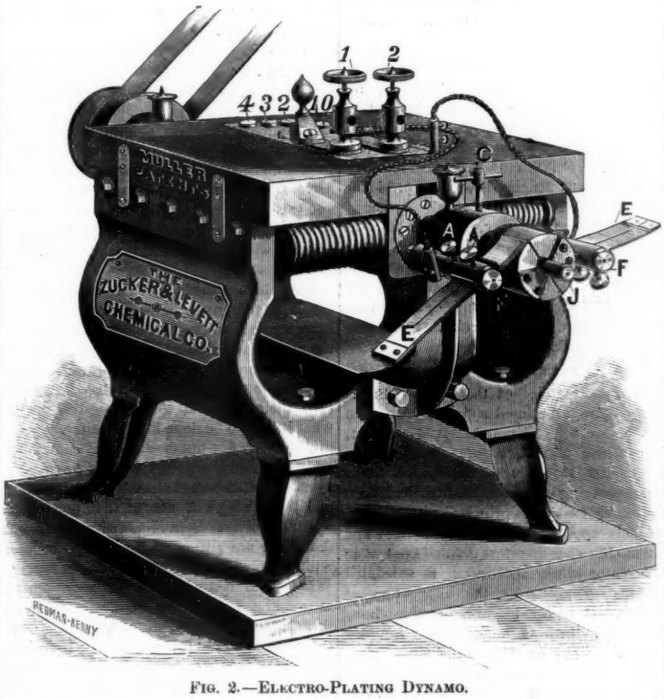


Fig. 2.—Electro-Plating Dynamo.

The Telegraph War Likely to Come to an End in a Few Days.

The impression in Wall street is very strong that the cable rate war will soon be ended. Friends of the Commercial Company say that it will not join the pool, but will restore rates to 40 cents a word, if the other companies will do the same. The French Cable Company holds a meeting Oct. 16, when it is thought the question of rates will be discussed with a view of forcing a settlement. Jay Gould is reported as saying, however, that he is opposed to any increase in cable or telegraph rates, and that he does not believe the rates will ever be raised, as the Western Union and the pooled cable companies have learned to make a profit on the large increase of business which the low rates have brought. He says that the Western Union now averages 6,000 cable messages a day, while 100,000 land dispatches are sent from the main office in this city every day.

This statement does not tally with that which friends of the competing company make. They say that the Western Union and the pooled lines are losing heavily by the low rates.

Another report in Wall street was to the effect that large holders of Western Union stock are endeavoring to obtain enough proxies to control the next election, and to oust Mr. Gould from the control. It was stated that Erastus Wiman, a director of the Western Union, but now intimately associated with Robert Garrett and the Baltimore and Ohio in the Staten Island enterprise, is seeking proxies in opposition to Gould. All former attempts to oust Gould from the control have been failures. Gould and his friends have held a majority of the stock, and Gould himself has been the largest stockholder. The present opposition movement seems to be based on the supposition that Gould has sold most of his holdings at high prices, and now is trying to depress the value in order to buy back.

Electricity in the Mountain.

An electric storm got loose out in Oregon the other day and almost frightened to death two attachees of the United States Geological Survey who were sketching the topography of the surrounding country from the summit of a high peak near Dixie Butte. The first intimation they got of anything unusual was a buzzing sound seemingly coming from beneath their drawing table on which one of them (Mr. Walsh) was working at the time, while a short distance off, under the shadow of a rock, slept his partner, Mr. Tweedy. In detailing the happening a local paper goes on to tell that on putting his hand beneath the drawing sheet Mr. Tweedy received an electric shock which sent him staggering back. The projecting rocks at the same time gave forth a humming, musical sound, and all of the surrounding air was evidently surcharged with electricity, passing into the mountain peak through all the crags and projecting points. The peaceful slumbers of Mr. Tweedy were disturbed at this time and he jumped to his feet, but was content to lie down again quickly, as when they were standing up the electric fluid entered them in such quantity as to cause a feeling like the pricking of needles. Their hair stood up like bristles, their muscles twitched, and, not having a contract to serve as lightning rods for that peak, they gathered up their instruments hurriedly and beat a hasty retreat down the mountain side to the middle fork of the John Day. Soon after, thunder, which had prevailed, ceased, and the peculiar electrical condition of the air passed away.

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EDITORIAL ANNOUNCEMENT.

Address all communications and make all Express Money orders, P. O. orders and checks, payable to order of ELECTRICAL REVIEW, P. O. Box 3329, New York.

We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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Frank M. Gilley, 54 Equitable Building, Boston, Mass., is our New England representative.
Mr. C. C. Haskins, 118 LaSalle Street, Chicago, Ill, will represent the REVIEW in the West.
Messrs. Wm. Dawson & Sons, 121 Cannon Street, London, England, are our representatives for Great Britain.

NEW YORK, OCTOBER 16, 1886.

CONTENTS.

	PAGE
A New Magneto Bell	1
A New Method of Protecting Iron	1
Penetrative Power of Light	1
Opening of the Electric Club Rooms	1
Surveying by Electric Light	1
Listening on the Telephone Line	1
Firing Steam Boilers	1
Electric Motors	2
Taking Portraits by Regulators	2
Self-Winding Clocks and Electricity	2
Electric Light Test	2
American Dynamo-Electric Machine	3
Down in the Earth's Interior	3
The Telegraph War Likely to Come to an End in a Few Days	3
Electricity in the Mountain	3
Editorial Notes	4
A Good Place for Electric Motors	4
Electricity *vs.* Gas	4
Book Review	4
Chicago Electrical News	4
Boston Electrical News	5
Interesting Result of an Electrical Inquiry	5
Telephonic News	6
A Funeral by Telescope	6
New Electric Light Testing Bridge	7
Change in Western Union's Board	7
Making Use of a Classic Waterfall	7
Telegraphic	7
Electrical and Scientific	8
The Voyage of the Volta	8
The Brush Electric Light Company in Detroit to Have Larger Quarters	8
Neatness in the Electric Light Factory	8
Digest of the U. S. Patents on Storage Batteries	9
Electric Light News	9
Electrical Patents	10

Many explosions in flouring mills are said to have been caused by electricity generated by belts. Even ordinary belts are found to generate sufficiently strong currents to perform the common experiments for which electrical machines are used.

The passage of the Suez Canal is ordinarily made in thirty-six to forty hours; but vessels fitted with the electric light apparatus can go through in sixteen hours. The advantages of the electric light are not difficult to discover in this case—or any other, for that matter.

A number of the metropolitan dailies present their readers once a week with an electrical department, in which appear mention of the latest discoveries in this science and of the practical progress made in all parts of the country. The work is generally very intelligently done, and is in the main reliable. One of the most comprehensive and interesting papers in this respect is the *Globe-Democrat*, of St. Louis, which has a carefully edited department devoted to electrical work and invention.

It would seem that electrical lighting is on the boom.

There is a gradual increase in telephone subscribers, and this is very welcome to the stockholders in the various companies, many of which have been compelled to practice the severest economy to prevent actual loss.

There is considerable brain tissue being expended on the invention of electrical torpedo boats just now. A new one, hailing from Rhode Island, has several points of excellence, its self-steering qualities being quite original and effective.

The American Institute Fair in this city is succeeding finely, and is attended by a large number of visitors. The arc lighting is furnished by the United States Electric Lighting Company; the incandescent by the Edison.

It was a very commendable action on the part of the president of the American Electric Manufacturing Company to make a gift of the Bartholdi statue lighting, after he had secured the competitive contract. The official ceremonies connected with the receiving of this statue by the United States occur on the 28th of this month.

We have not heard for some time from our new friend who was to build a vacuum balloon, with electricity as the motive power, which was to carry 200 passengers at an altitude of four miles, from New York to Chicago in three hours. There are a great many persons who would like to get over the distance between these two cities in that time or less if it could be done safely, and we should dislike to hear that the inventor has become discouraged.

The Sawyer-Man Electric Company, recently organized, as announced in another column, has the following directory: Henry C. Davis, H. R. Garden, H. B. Putney, New York; C. C. Coffin, F. P. Fish, Boston. We understand that Mr. Davis will be president of the new company. As general manager of the Consolidated company, Mr. Davis has won a high position for business sagacity and executive ability; now that he enters on a wider field, the excellent work done with the Sawyer-Man system of incandescent lighting during the past year will not only be continued, but noticeably enlarged.

The Patent Office of these United States gets pretty well confused at times. A case in point: One S. H. Byrne received a patent, (No. 331,680) on apparatus for drawing wire, December 1, 1885, yet an application for a patent covering the same features had been filed nearly two years prior by another party, and this application was still alive. The Patent Office has therefore granted a patent to an inventor whose application is antedated nearly two years by the application of another. It might be well for the official patent examiners to more closely examine the applications on file. In the case cited above, it would seem difficult to find a remedy now, the patent having been issued, and the first applicant unrecognized through the carelessness of some one in the Patent Office.

Mr. John Robinson Whitley, who represents the English side of the American Exposition in London, has returned to England and has cleared up the situation there as to the enterprise. Contracts for the site have been signed, and men have gone to work to clear the ground for the buildings. The site selected is at Earlscourt, a very central location and convenient to railroads. The contractors agree to have the buildings ready in ample time, and applications for space are numerous. Mr. Rufus M Smith, who was Chief of the Installation Bureau at the Centennial Exposition, has arrived, and will fill the same office at the American Exposition. Mr. Townsend Percy, of New York, has been appointed head of the Literary Bureau. The prospects of the exhibition being a great success are particularly good.

A GOOD PLACE FOR ELECTRIC MOTORS.

The late Charles Spooner, seeing a drawing of the air engines used in the construction of the Mt. Cenis tunnel, made a design for a compressed air locomotive, which was built by the Baldwin locomotive works, for the Plymouth Cordage Company. It was found by this company that a great saving was made by using this power in moving materials and unfinished stock about the yard of the mills over the expense of horses, wagons and drivers. Pipes were placed in the yard, with hydrants at convenient positions from which the tank of the engine could be filled at any time, as the pipes were connected with a large tank filled with air at 200 lbs. pressure. This is reduced to 90 lbs. before entering the cylinders by an automatic valve.

Mention is made of this plant to show that there is a field for motors in the yards of many factories. The number using, or about to use, electric lighting plants is very large, and surely no great expense would be incurred in establishing an electric road where no additional outlay for the generator is required, and where the distances for transmission are small.

ELECTRICITY VS. GAS.

In our opinion there should not be any conflict between gas and electricity as illuminating agents—our contemporaries in the field of gas journalism to the contrary notwithstanding. Each has its special sphere, and instead of being considered rivals should be co-laborers, each doing that part of the work of lighting for which, commercially and otherwise, it is at the present time especially fitted.

Practical experience has demonstrated that electricity, by means of arc lights for street illumination, is both the cheapest and the best.

Incandescent electric lighting has economically displaced gas in a number of large installations where the power required to drive the machinery was not too costly, and it is equally true that for domestic purposes, where the number of subscribers are few and widely separated, that gas continues to hold its own.

Such being the admitted condition of affairs, at the present writing, it would seem more sensible on the part of large, as well as the numerous small gas companies throughout the country, that they should cease their complaining and abuse of electricity and turn their attention to the question as to what is best to be done in the matter.

That there are hundreds of gas companies which have been seriously affected financially by the introduction of electric street lighting, and the consequent loss of that portion of their patronage is undoubtedly true, and that there are still more that sooner or later will be likewise injured, goes without saying. What is to be done can be very simply answered. Let all gas companies make up their minds to adopt arc lighting for their street illuminant. Gas companies, by reason of having a perfected organization, owning their lands, buildings, plant, and possessing a corps of competent men, can introduce the electric light at less expense than would have to be borne by a new company solely devoted to operating an electric lighting plant in their territory.

Further, the gas companies, while being thus protected from any serious encroachments upon their business, are in a position to gradually take advantage of all new advances in the electric field—and on a commercial basis—not as unfortunately has been only too frequently the case on a fancy stock jobbing basis, or where the majority of the stock of the company has been issued for patents for devices which the march of improvement have rendered utterly valueless and of no use.

In point of fact we understand that the above view of the matter has at last dawned upon the minds of a number of the Rip Van Winkle-like gas companies throughout the country, and that before long we shall see many combined gas and electric light plants in full operation.

BOOK REVIEW.

THEORY OF MAGNETIC MEASUREMENTS, with an appendix on the Method of Least Squares. Francis E Nipher, A. M., Professor of Physics in Washington University, and President of the St. Louis Academy of Sciences. 94 pages. D. Van Nostrand & Co., 23 Murray street, New York.

This is a welcome contribution to the literature of electricity and magnetism relating directly to coast and geodetic survey work. A brief theory of Magnetic Measurements is followed by articles on declination, determination of scale value of the magnet, determination of magnetic axis, inclination, pendulum vibrations, moment of inertia, moment of inertia of magnet, computations of actual observations being given in many cases; instructions for making the proper corrections for temperature, torsion, magnetic moment, plates of the instruments employed and an explanation of the system of units conclude the main portion of the book. The appendix contains a clear description of the Method of Least Squares. At the end are given tables of the time of elongation of polaris and azimuth of polaris at elongation as data for determining the true meridian. The increase in the number of volunteers of observers of meteorological display, shows that there areimany who will find this a valuable aid.

CHICAGO ELECTRICAL NEWS.

One of the old, old timers in electricity, who commenced as a very small messenger boy before a telegraph line had spanned the distance from the Atlantic to the Lakes, is to-day repeater chief of the Western Union Company, at Buffalo—Mr. Madison Buell.

On the first of October, at the meeting of the Buffalo Electrical Society, Mr. Buell read an extremely fine paper, entitled "The Genie Electron," which, as its title would indicate, is a bright poetical prose effusion.

The speaker explained that this electrical spirit pervades all matter, and is the implement of Deity in carrying out his will in the government and for the purposes he had in the creation of the world. "It is," said he, "in the bright clouds far above the earth, that he sometimes likes to nestle, or when their bases touch the mountains and their tops shine in the far-off ether, he will stretch forth his powerful arm, and seem to bathe himself in the tenderest purple of distance. At other times he will softly breathe his spirit in the air, sigh, and send his moan along the woods and moorish fens, and up among the loose, disjointed cliffs as the sad notes of the coming storm. When the black-winged legions of tempest arise, he delights in leaping from cloud to cloud, and the tremendous roar of his voice is rolled back from the mountain's bosom as the recognition of the dazzling brightness of his flashing eye.

"Calm and serene he drives the furious blast,
And pleased the Almighty's order to perform,
Rides in the whirlwind and directs the storm.

Mr. B. referred in detail to the earthquakes of modern times, and asked whether it were not possible that the cause of these disturbances is due to the chemical action of which "Electron" is supposed to be the immediate agent? The earth's interior he thus assumed to be the—or one of the—work-shops of this jolly, hard labored spirit, while in his hours of recreation one of his favorite resorts is in high polar latitudes, where, transformed into an aurora,

"His beautiful spirit moves up and down in the dance,
With the magic of motion and sunshine of glance."

Mr. Buell, when near the conclusion of his paper, asked: "After all, what is life?" and answered:

"It may be considered as a series of definite and successive changes caused by the genie 'Electron' in the structure and composition of a body without destroying its identity." In other words— "* * * The feeble residual magnetism in the iron core of the electro magnet, as I illustrated, was by proper means lifted up by degrees until it was developed into the marvelous and shining light—equal in brilliancy to that of the sun, the source of all light. And as I

said, it is so with human life. The spirit of God is within it. It makes no difference how coarse or low the form, nor how weak the spirit. The feeble spirit can by proper means be exalted to a sublime degree, and so illuminate the human character that its brilliancy and purity can far exceed the luminosity of the voltaic arc. We may all fail to comprehend the fearful sublimity of life, but of one thing we may feel assured, and that is the supremacy belongs to the great spirit above and not to matter."

"The soul secure in her existence smiles.
The stars shall fade away, the sun himself
Grow dim with age, and nature sink in years.
But Thou shalt flourish in immortal youth,
Unhurt admidst the war of elemets,
The wrecks of *matter* and the crash of worlds!"

Considerable stir has been evinced by the electric light companies representing various systems hereabouts, by the column advertisement in our daily journals, comprising a challenge to any and all manufacturing companies of electric arc light apparatus in the country, to meet in a thirty days' competitive test in all the points of superiority claimed for the American (Wood) dynamo machine and lamp. Each company entering the test to deposit a sum of $1,000 cash, in such bank as may be mutually agreed upon by the contestants, as an entry or admission fee for:

1st. Defraying the expenses of the test.

2d. The balance to belong to the winning company, which shall immediately donate it to the Charleston sufferers.

While the challenge is open to acceptance by any of the manufacturing, or parent—arc light—companies, it is made with special reference to the Thomson-Houston company, of Boston, Mass.

As a railroad man would put it, "this ticket is good for thirty days from the date stamped thereon—Oct. 1, 1886—and just as soon as I polish off this gentleman, the rest of you fellows will have an opportunity to get your little satisfaction."

Seriously, it is nearly time for an excitement in the electric light business. The public hanker after an exhibit that has some vim and business at the bottom of it. The dear people want racket and noise, and love to see the fur fly. "When the devil picks geese, saints fill their beds;" and a thirty-day trial of the nature intimated in this challenge, with an admission fee of 25 cents, would keep the dynamo room full the entire month. And the fund could be applied to the erection of a magnificent confessional altar, where poor, benighted electric light men who have been in the constant habit of telling little what-you-may-call-'ems for the past few years—all in the way of business—might cast their burdens, and wash their guilty sins away.

And knowing the inclination to jealousy that pervades the electrical heart throughout the world, "be it expressly understood and agreed," that only the wounded bird shall flutter in the cause. It is not you, reader, that is pointed at—it's that other fellow.

There is a mystery here, with no present prospect of a satisfactory solution. A Chicago gentleman who has every appearance of uprightness and belief in what he states, tells of an elderly gentleman, immured within the boundaries of a New England State, who, after having studied and experimented for something like forty years, has produced a method of incandescent lighting which will furnish an equivalent of gas, at a cost of 50 cents per thousand.

The aggregate modesty of all the "first readers by sound," the "original fire alarm inventors" and the "ninety and nine"—one still to be heard from—Tichbornes, who invented the telephone, cannot hold a candle to this last and best of the electric lighting fraternity. Not even his name is permitted to be known; it is impossible to learn his whereabouts and the method is as gloomy as the ways of the great and original spirit of Darkness. All that is known of the mysterious way is that it is a battery, ten or a dozen cells of which will run nearly as many 16-candle-power lamps successfully.

Notwithstanding the excellent success which he has thus achieved, his ambition is not satisfied, but he is working on a motor for street car purposes, and at 70 years of age is hoping to strike something better than an incandescent electric light system which is every way the equivalent of good gas at half a dollar a thousand feet.

Prominent at the Industrial Exposition is a Ball dynamo, and a system of 20 Ball lamps, with an ornamentation in the form of a Haskin's hanger at each of the four corners of the space where the General Western agent, Mr. C. W. Raymond, holds sway. In addition to the arc circuit proper, a group of incandescent lights is arranged to be substituted for one or more of the larger lamps. The plant, which is solely an exhibit, is driven by a 40 horse-power Ide & Son engine, which has a now arrangement in the form of a horse-power indicator, the truthfulness of which is capable of demonstration at any time while the engine is in motion. This is one of the elder Ide's conceptions, and is the outcome of his other curious attachment, which tells at each stroke the inches of steam used by means of a movable po

Cards taken by Mr. A. L. Ide, are figured by him, and given as follows:

Friction 9×12 inch engine and dynamo and power required for 20 arc lights.....17.12 H. P.
Friction card, engine alone,.... 4.30 " "

12.82

or $\frac{64}{100}$ horse-power per light per hour, including friction of dynamo, or the power required at pulley of dynamo.

Friction card of engine and dynamo.....6.00 H. P.
Friction card of engine..... ....4.30 " "

1.7 H. P.

12.82
1.70

11.12 horse-power, or $\frac{55}{100}$ per lamp, deducting the friction of dynamo.

Yours, truly,
A. L. IDE & SON.

And then again, the Ball Company has a little machine for a cent, run by a new form of gas engine, which claims to be an advance, in that it takes gas at each revolution—attached to which are four lamps, endeavoring to prove the possibility of using gas engines for electric lighting.

Messrs. Wunder & Abbott, who have a considerable central plant here, have made some changes latterly, which include the putting in of a pair of twenty-five light Ball machines.

The Bain dynamo and system of lamps has finally come out from under the bushel which has latterly hidden its light, and is shown at the exposition, by the Domestic Heating and Illuminating Company, of which Mr. C. S. Cleaver is the superintendent, and whose place of business is at 82 Jackson street.

Part of the outfit of this company is the McKinley air engine, which is claimed to furnish one to four horse-power for a nominal cost of ten cents per day, without boiler, engineer, supply pipe or exhaust. Both arc and incandescent lamps are exhibited.

The general lighting of the exposition is done by the Sperry Company, who also run a motor or two for Giles Brothers, to illustrate the action of magnetism in horology, and the preventive properties of the magnetic shield.

CHICAGO, Oct. 11, 1886.

The Southwestern Electrical Supply Company, J. J. Everingham, president, has opened a supply house in Kansas City, Mo., and will deal in electrical construction material and tools of all kinds, making a specialty of electric light globes and carbons. The company is well located to secure a large business.

BOSTON ELECTRICAL NEWS.

The arc plant of the Portsmouth Electric Light Company is now running, 33 eight ampere Ball lights being at present in operation. Shortly 25 lights will be needed for street lighting, and the outlook is good for the growth of a large company. The incandescent lights from sun distributors in series on a Brush machine will be in operation in a few weeks.

The Jarvis Engineering Company have orders for an additional Armington & Sims engine each for the Woonsocket Electric Light Company, and the Fall River Electric Light Company, both operating the Thomson-Houston system.

The station of the Edison Electric Light Company in Bumpstead Court, Boston, will soon need enlarging according to the original plans, which were for a 10,000 light station. The full capacity of the six dynamos is 1,800 amperes, and the output every evening is over 1,500 amperes. Two 120 horse-power horizontal tubular boilers with Jarvis setting are at present in use. One engine with the complement of two dynamos is used for the day circuit till 1 P.M., two engines are run till 5 P.M., from which time till 10 o'clock three are in use. The second engine is stopped at 11.25. A testing room and storeroom for oil has been constructed, so that a 12 inch wall separates them from the engines and dynamo rooms. At present motors of various sizes and for purposes which give variable loads. Incandescent lamps, a portion of which being in the Bijou Theater are suddenly turned off and on. The consumption of current by the motors is extremely irregular, still there is no flickering of light caused thereby and the station has not had a detention of a single kind since starting. This is probably the model station for general distribution of electric current at constant potential. The main room is neatly sheathed on the lower part by dark wood. The disposition of the switches, ammeters, current indicators and regulating wheels leaves nothing to be desired in the line of completeness and adaptability to the work. The excellent condition of the machinery and the unusually good results obtained in the steadiness of the lights is due to the efficient chief engineer, D. J. Mullica, who, with the assistance of J. W. Crosby, as superintendent of light regulation, has, under the trying condition of a varying load, caused by the irregularities of the lights used in the theater, given most satisfactory service.

It was a matter of some surprise to those well informed in electrical matters that such broad claims should have been allowed to one Goldner for the use of bichromate of soda in a battery. These patents are and have been the property of the Chemical Electric Light and Power Company. It seemed as if something must have been overlooked. A patent broadly covering the use of bichromate of soda in a battery has been granted recently; the same having been covered in England some time ago. The position of the Chemical company is considerably strengthened, as they were fortunate enough to become possessed of the U. S. rights.

BOSTON, MASS., Oct. 12.

INTERESTING RESULT OF AN ELECTRICAL INQUIRY.

The ELECTRICAL REVIEW is in constant receipt of inquiries covering all departments of electrical work and invention, and has made it a rule to turn these into those channels where we were sure the wants of the inquirer would be best served. We receive many grateful letters in the course of a year, not only from our correspondents, but from those firms of our acquaintance who have received new business through this means. We take this occasion to publish one below which not only is interesting to us in showing that our efforts have been appreciated, but will be of interest to the entire electrical fraternity in showing another new field in which electricity has been made to do original and economical service:

NATIONAL ELECTRICAL SERVICE CO.,
686 BROADWAY,
NEW YORK, Oct. 7, 1886.

TO THE ELECTRICAL REVIEW,
New York City.

GENTLEMEN: Your letter concerning an inquiry received from the American Water-Works and Guarantee Company, of Muncie, Ind., has already produced good results.

Accept our heartfelt thanks, not only for the order which has come to us from the letter referred to, but also for the interest in our enterprise which is evinced by you in caring to remember us and forwarding such inquiries to our house directly. We appreciate the fact fully that it does not pay to advertise in a medium whose interest in you ceases with the securing of an "ad." and the payment therefor; but it does pay to advertise in a medium the proprietors of which bear your welfare in their minds, as well as their own.

Thinking you might feel interested in knowing what the American Water-Works and Guarantee Company wished us to accomplish, we write you this to give you an idea.

They are establishing all over the United States water-works in cities, villages and towns, in which they use a modification of the direct-pressure principle. They erect on a high hill a stand pipe or tower, and locate their pumping works usually in a valley near the water supply. Ordinarily the water is pumped direct into this tank, and then circulated through the main pipes by its gravity; but in case of a fire in the city or village, the alarm is turned in at the pumping works, when the engineer shuts a valve in the pipe leading to the stand tower, and puts the full force of his pumps on the city mains direct. This system has been found to be admirable, answering its purpose perfectly but for one defect, *i. e.*, when the alarm comes in the pumping works, it is necessary to send some one to the stand tower to shut off the water; and as this stand tower is from a mile to possibly two miles and a half from the engine room, considerable time is necessarily taken up by the man's going that distance. It was possible, of course, to arrange an electrical bell, or telephonic connection, between the pump room and the stand tower, but this would necessitate placing an attendant at the stand tower whose salary would, of course, amount to a great deal, that really seemed an unnecessary expense, during the year.

We have advised, and are now installing for them, a plant of our electric valve service, the first one of which is to be placed in operation in Sioux Falls, Dakota. We place an eight-inch water valve directly at the stand tower, and run our wire from thence to the engine room, where the battery is located, and also a switch, having two contact points, one of which is marked "On," the other "Off." Now, when the alarm comes in, the engineer simply throws the switch on the point marked "Off;" the valve is closed instantly, even though the two stations should be five miles apart. As soon as the second signal comes to the engineer, notifying him that the fire is extinguished, the switch is thrown back, the valve is again opened, and everything goes on as usual.

Thus, you see, through your kind remembrance of us, we are enabled to do possibly a large business in this line, and, on the other hand, the water-works company have attained a result that was almost a necessity to them in their business.

Again thanking you for your interest in our behalf, and wishing yon every success, we remain,

Very truly yours,
NATIONAL ELECTRIC SERVICE CO.
W. C. TEMPLE,
Secretary and Treasurer.

Telephonic News

*** In New Zealand the railroads, telegraph and telephone systems are all owned and worked by the government.

*** A temporary injunction was granted a Brooklyn lady last week, to prevent a telephone company from erecting a pole in front of her premises.

*** The September product of the Lake Superior copper mines is reported as follows: Calumet and Hecla, 2,785 tons; Quincy, 375 tons; Franklin, 216 tons; Atlantic, 214 tons; Huron, 105 tons.

*** At the St. Louis telephone convention a speech was made by the President of the Erie Company, but up to the present writing we have been unable to find any one who understood it. Consequently it has not been published.

*** A story about the Bell Telephone patents having been offered to Senator Cameron at a mere nominal price early in the history of the invention has been going the rounds of the press. It was mentioned to the Senator, who is in New York, when he said: "There is not a word of truth in it. I never spoke to Mr. Bell in my life and scarcely know him by sight, although he lives near me in Washington."

*** The Vienna *Electro-Techniker* states that the Consolidated Telephone Construction and Maintenance Company and the Telephone Company of Austria have met with a severe rebuff at the courts in Austria. The first-named company had lodged an action for annulment of the patent of Prof. Alexander Graham Bell, the well-known inventor of the telephone, in order to protect its Austrian establishment. This action, like many others, has now been dismissed with costs by the Austrian judicial authorities. As in England, the Bell patent remains, consequently, in force in the dominions of the Austrian monarchy, and the Telephone Company of Austria, being infringers of that patent, will have to reckon with the patent owners.

*** In Philadelphia last week, the monotony of Select Council was broken by the decided and outspoken opposition of some of the members to the granting of privileges for laying underground conduits for telegraph and telephone wires. When the ordinance was read allowing the Postal Telegraph and Cable Company to use certain streets under which to bury its wires Mr. Monroe vigorously opposed its passage. He expressed distrust as to the good faith of the corporation, and thought, as certain privileges had been recently granted which had never been used, except to dispose of stock, that Councils should move cautiously. The bill was also opposed by Messrs. Ryan, Stuart and Thornton, and was defeated on final passage. A similar ordinance relating to the Bell Telephone Company was called up and postponed.

*** An English professor of mesmerism was "interviewed" by a local reporter, who, after questioning him on a variety of matters, asked whether he had ever succeeded in casting a mystic spell over a subject who was at a distance. "Yes," was the professor's response. "At Glasgow I was successful in mesmerizing by telephone. I had previously experimented on some young men, and I instructed them to place themselves at a telephone in the offices of Messrs Lipton, who are large butter and egg merchants. I was in Messrs. Currie, Thompson & Co.'s office, and gave them directions by wire what to do. I think expectation had a good deal to do with it; but, at all events, they all went off into a trance, and Drs. White, Granger and Lowe, eminent physicians in Glasgow, satisfied themselves of the genuineness of the phenomena by running pins and needles into them."

The Trouble a Button Hook Made.

One of the busy telephone lines running out of Wilkes-Barre was reported "grounded." A $2.50 per day lineman and a $3 per day horse and buggy started after the trouble. After a long drive, the end of the line was reached, but the wire in all places was clear of the ground. The disgusted lineman now turned his steps homeward, looking for the trouble at each instrument. The station nearest home was reached; the lineman's hand went up to the top of the bell and grasped a lady's button hook that touched one of the line posts and the ground post, making a sufficient "ground" on the line to bring down upon the heads of the poor operators the usual blessings of enraged subscribers.

Moral: Don't make a shelf of the telephone bell; but if you will put things up there, let them be rubber combs, pocket books, or other non-conducting articles.

A Funeral by Telescope.

Listening to a sermon by telephone is not an uncommon occurrence, that feat having been successfully attained on numerous occasions. And now a correspondent in this State tells of a new and unique use a telescope was put to. The incident came under his observation while traveling on Lake Champlain:

Did you ever hear of attending a funeral from a distance by a telescope? Then I will tell you a fact. It was during the progress of the Adirondack survey, and some of the choicest instruments had been brought to Juniper Island, about three miles off from the Burlington breakwater. The dwellers on the island asked of the director of the survey that they might look through his most powerful glass. At a certain hour the request was granted, and the director adjusted the glass so as to cover a certain farm house that was pointed out. The islanders wore unusually long faces. The one who was peering through the glass became deeply agitated; the other islanders took their handkerchiefs from their pockets. The observer called out: "There, they are getting through the services; now they are bringing the body out; now they have him in the hearse." With every new announcement the little group of friends set up a new wail, and there was no pause till the procession had disappeared behind a hill. The telescope was then returned with as much gravity as it had been borrowed and used.

*** Colonel Gouraud, who has done much to introduce American electrical appliances in Europe, has spent the past summer in this country, and will presently return to England with his family, to look after his telephone interests there. His wife is a daughter of the late George M. Snow, for many years a well-known journalist in this city.—*N. Y. Tribune.*

*** Says the N. Y. *Tribune's* "Man About Town:" "Almost the first person the stroller encountered as he started out was Theodore N. Vail, of the Metropolitan Telephone Company. A handsome and stalwart gentleman with curling brown hair, a curling brown mustache and dark blue eyes is Mr. Vail. He has made a fortune out of telephone stock. He was for years the manager of the parent company at Boston. He tells me that the New York company has been hoping to get the underground wire question settled satisfactorily and that he would be glad to get all his wires buried by next year if he could only get a chance to do it."

*** The Berkeley street division of the new underground system of the N. E. Telegraph and Telephone Company is completed. The main portion which connects this branch with the Tremont street branch office, and by the way of Tremont street with the old portion of the underground system at the corner of Franklin and Arch streets, will be in all 2.7 miles in length. One-half mile of the conduit is to be of cement, the remainder of creosoted wood. Two-hundred wire cable are to be used in a portion of the conduit. The company has lately been building its trunk lines of cables containing 80 conductors, 16 Brown & Sharpe gauge with extra heavy insulation.

Telephone Improvements in Cincinnati.

The account published below is taken from the columns of our enterprising contemporary, the Cincinnati *Enquirer*, and while it contains matters that are not new to many of our telephone readers, the whole is an excellent and interesting account of the work being done by General Manager Stone for the improvement of the service in the Queen City:

A great age this. A fast age. "Time is money" in this day and generation. Every thing has to hustle and everybody goes hurrying, scurrying through life at a breakneck pace. What would our slow-going, calm and deliberate old forefathers, with their stage-coaches, their mounted mail-carrier on his old "hoss," with his saddle-bags full of letters that had long been chestnuts and should have had the bell rung on them, and their ox team mode of travel, think if they could look upon these days and see their rapid, rushing descendants flying across the country in lightning expresses at the rate of a mile a minute, their mail delivered with the ink on the letter scarcely dry yet, and the telegraph girdling the globe in the twinkling of an eye? The *ne plus ultra* of this lightning age has about been reached when A can go to his telephone and in five seconds be conversing with B five miles away. If any thing were impossible in America in the nineteenth century this would seem incredible; but it is a fact. The people of Cincinnati will have a practical illustration of this marvelous spanning of space in a very few weeks, by November 1st at the furthest, possibly by October 2 th. It is nearly four years ago now since a Chicago concern, the Western Electric Multiple Company, began the manufacture of a new and improved telephone switchboard. Since then improvement after improvement has been made on the board, until now it is supposed to be about perfection. The Bell Telephone Company of this city has just purchased, at a cost of $25,000, one of these switchboards from the Chicago concern. In conjunction with the purchase of the switchboard the telephone company is making other vast and extensive improvements. The company at present maintains three exchanges—one at Fourth and Walnut, one at Front and Elm, and one at the Public Landing. All three are being consolidated at the Masonic Temple, at the corner of Walnut and Third. Cincinnati has long enjoyed the reputation of having the best telephone service in the country. When the present improvements are consummated it will unquestionably have the finest exchange in the world. The company has leased for this consolidated exchange a room 69 feet by 42 feet, with thirty-five foot ceilings, on the fourth floor of the Masonic Temple. An *Enquirer* reporter who dropped in there Friday afternoon saw a very busy scene—a remarkable scene, in fact. About sixty men were working away as busy as nailers, and still there was scarcely a sound to be heard; not a word was spoken. The men were adjusting wires and cables, and going through other ambiguous motions that no one not conversant with the tricks and technicalities of the electrical trade could make head or tail of. These men were sent on here from Chicago by the Western Electric Multiple Company to do this work. The work is quite a knack, and these men are regularly employed in fitting out telephone exchanges. Meanwhile the telephone company has about 200 men outside, stringing cables and putting up new poles, sixty-five feet in length. Below Fourth street the entire plant is being changed. These outside improvements are made necessary by the advent of the duplicate switchboard. The expense of the entire improvement, inside and out, will approximate $100,000. In addition to the $25,000 that the telephone company pays for the new switchboard, and the putting in thereof, it has to pay the concern manufacturing the board a royalty of $1 per annum for every line connecting with the exchange, so that if the company has twenty-five hundred subscribers, the Chicago manufacturers receive $2,500 a year royalty. The important distinction between the new and old style of switchboard is that with the old style one operator could only cover a small portion of the circuit. The result was that when the call came in, "Hello, exchange! connect me with No. 999," and if that number did not happen to be on the switchboard of the operator receiving the call, that operator would have to write out the number on a card and send it across the room to the operator with whose board 999 was connected. If 999 happened to be talking at the time, the second operator would have to write the fact on a card and send it back by messenger to the first operator, and the operator who had received the call would apprise the subscriber calling. This is where the telephonic delay and tardiness that has made many a mild-mannered Christian gentleman an artist in cow-boy profanity came in. The new duplicate switchboard does away with all this delay. Each operator is in communication with every telephone in the entire circuit. A number is called for; the number is right before the operator, who knows at a glance whether the subscriber asked for is talking, and can make connection at once. So perfect is the new arrangement that under it, provided the party called responds promptly, connection can be had and conversation over the line begun in five seconds after the call has been made in the exchange. The duplicate board, which has just been set up in the new exchange room in the Masonic Temple, is in eleven sections, and is about sixty feet in length. It is a very handsome affair, being of solid mahogany. It is the first switchboard of the kind set up in this State. A number of Eastern telephone men, who passed through here *en route* home from the Telephone Convention at St. Louis two weeks ago, were unanimous in the sentiment that when the improvements now in progress are completed, Cincinnati will have the finest and best-equipped exchange and the most perfect telephone service in the world. This duplicate system requires for the 2,200 subscribers of the Cincinnati office the enormous number of 104,000 wires and thirty-three operators. The exchange, when the new equipment is in working order, can accommodate 5,000 subscribers. "The telephone business is unlike any other business on earth," said Captain Stone, the genial and accommodating manager of the Bell Company, "for the reason that as the business increases the profits diminish. When the Cincinnati Exchange was first opened in the fall of 1877, we had two hundred subscribers, and could afford to rent a telephone for $3 per month. One operator could take care of the whole two hundred telephones. And why? Because one subscriber could only talk to 199 others. When we had one thousand subscribers, it required one operator to every fifty telephones, because each one of the one thousand subscribers could talk with 999 others. Now that we have twenty-two hundred subscribers, we have to employ an operator to every twenty-four telephones.

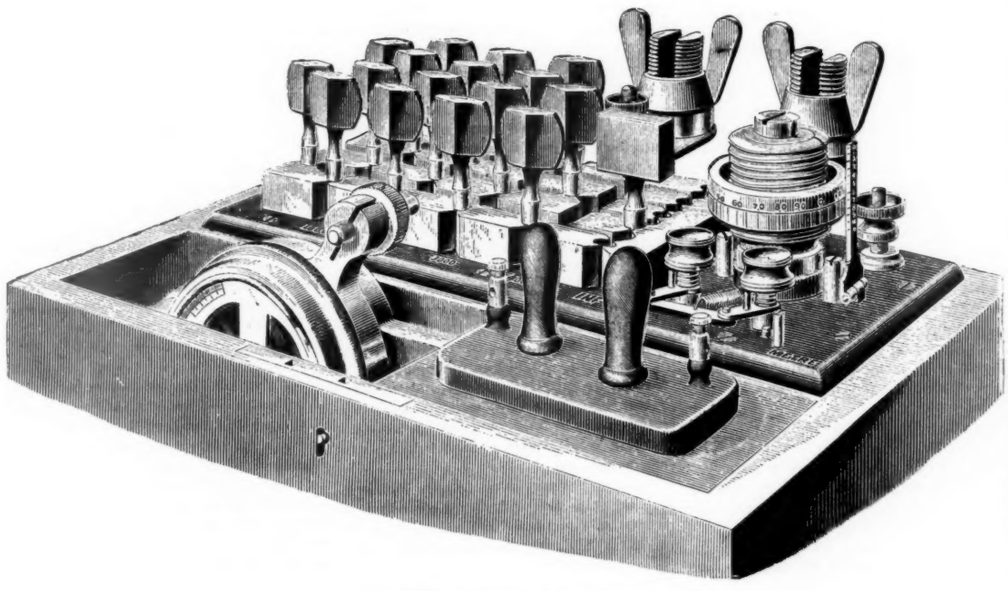
"In order to meet this increasing expense, we have been obliged to gradually raise the rental of telephones from $3 a month to $100 a year. This, however, is no hardship to the subscriber. He receives an equivalent, for every new subscriber connecting with the exchange makes his telephone just that much more useful and valuable to him."

The improvements being made embrace another important new feature. Instead of the wires coming into the town singly, as at the old exchanges, they are conducted to the town of the new exchange in cables. These cables are lead pipes. There are three hundred cables, and each cable contains one hundred wires. The cables afford protection to the wires in storms, and thus diminish the chances of annoying complications, and besides do away with the web of wires which disfigure the appearance of telegraph and telephone offices. Still another new feature included in the improvements being made is a device for protection against lightning, and the danger to the operator of a telephone wire coming in contact with the deadly electric light wire. Although, and it is a rather remarkable fact, no telephone operator, notwithstanding the dangerous exposure the occupation offers to that element, has ever been injured by lightning, wires are fre-

quently distorted and twisted, and exchanges even burned by it.

In the tower where the wires from without are connected with the wires from the operating room, are a number of uniform strips of wood. On each side of them are brass plates. To one plate is affixed the wire from without, while to the other side the wire from within is connected. Between the two plates is an open space of two or three inches. This leaves the circuit open. In order to close the circuit the space is filled in by a fiber, an imitation of hard rubber and a perfect non-conductor, in which is packed a piece of gold foil, the greatest known conductor. The gold foil will carry just a sufficient current to the circuit and no more.

If a strong current meets it, it will burn the gold foil, and that once destroyed the fiber beneath it being a perfect non-conductor, carries it no further, and harmless and impotent it stops right there. On every telegraph pole there is being placed a box containing the fiber and gold foil and so arranged that they sustain the identical relation to the cables that the same preparation in the office does to the wires. Beside the $1 a year royalty which for every subscriber the local telephone company pays the Western Electric Multiple Company on the new switch-board described above it has to pay the Bell Company $20 per annum royalty on every "set of instruments." A set of instruments consist of a hand telephone and transmitter. Captain Stone expects that this new, elegant and perfectly equipped consolidated exchange will be open for business some time between October 20th and November 1st.



A New Testing Bridge.

New Electric Light Testing Bridge.

To provide for the needs of electric light engineers, Messrs. H. Davies and E. J. Moynigan have designed a neat form of portable Wheatstone bridge which will measure from $\frac{1}{1000}$ ohm to 10 megohms. The bridge is manufactured by Messrs. Woodhouse & Rawson, London, and with galvanometer and battery is contained in a polished box 10½ in. by 7½ in. by 7½ in. Or in some cases the battery is carried in a separate box, when the dimensions of the bridge become 13½ in. by 5½ in. by 7½ in. This instrument will cover all the needs of a large installation, says *Engineering*, and will measure both the copper resistance of the armatures of the dynamos and of the leads, and the insulator resistance of the wires. The chief feature of novelty in the apparatus is that it combines two distinct bridges in one box, and so arranged that the same connections are used with both, the only alteration in shifting from one bridge to the other being the shifting of the contact keys, which are of a new and compact pattern.

The first bridge which is separated from the second by the infinity plug hole, is a Wheatstone plug bridge capable of measuring resistances from 1 ohm to 10 megohms. This has coils of 100 ohms and 10 ohms in one ratio arm, and 10 ohms and 10,000 ohms in the other, together with coils giving a total resistance of 10,000 ohms in the adjustable arm.

The second bridge, by which resistances may be measured from .001 to 100 ohms without using a greater ratio than 10 to 1 in either direction, is a modification of a slide wire bridge, in which the slide wire is coiled in one groove, and the battery lead in the other groove of a double-threaded screw cut on an ivory cylinder. Contact is made between the two wires by a double brass spring attached to an ebonite ring which screws up and down on the ivory cylinder, the ring being graduated from 0 to 100 on each half of its circumference, the number of half-turns being shown by a vertical graduated scale. The whole length of the slide is thus divided into 1000 parts. The resistance is measured by adjusting the point of contact on the slide wire which forms the ratio arms of the bridge, and so balancing the unknown against the most suitable of four coils, which respectively have resistances of .01, .1, 1, and 10 ohms each. The infinity plug-hole and the plug-holes of these four coils are larger than those of the other part of the bridge, and have but one plug between them, the two bridges being separated by the infinity plug-hole. When the bridge is used for high resistances the contact keys are turned to "high" and the infinity plug is put in. When it is used for low resistances the contact keys are turned to "low," and one of the four above-mentioned coils plugged, leaving the infinity hole unplugged. The use of the slide wire is particularly advantageous for low resistances, and combined with the other bridge gives everything required for contractors' testing and work of a similar character. The illustration shows the upper part of the box containing the bridge, with the lid removed. A pair of large Woodhouse and Rawson split terminals for connection to heavy cable are shown in position. There is also to be seen a battery, and a very delicate astatic galvanometer with suspended needles. The workmanship and accuracy are of a high standard, and the bridge will fully meet the purposes for which it is designed.

.... If all the creditors of the Schuyler Company will agree to it, the plan will be adopted of organizing a new company made up of the present creditors and old stockholders, to take charge of the business. The capital stock will be divided into preferred and common, $400,000 of the former for creditors at par, and the $100,000 of the common for the stockholders.

.... In the case of Western Union Telegraph Company *vs.* Brown, the Supreme Court of Indiana held that in an action to recover a penalty for failing to transmit a telegraph message it was necessary for the plaintiff to show affirmatively that he was the sender of the message.

.... The Northern Railroad of France has found by experiment that nickel can be rolled upon soft steel plates in such a manner as to produce a material for lamp reflectors of equal brilliancy with those made of silvered copper. These reflectors are reported also not to rust, and, owing to the greater strength of the material, to be less easily knocked out of shape. The cost is only 55 per cent. of the cost of silvered copper reflectors.

Changes in Western Union's Board.

A meeting of the Executive Committee of the Western Union Telegraph Company was held last week, preliminary to the annual meeting of the stockholders this week. It is understood that several changes in the directory are likely to be made, looking to an increase of the strength of the board in practical telegraph men, and men who can command the friendship of other large interests, as well as to give a representation to new interests that have lately been identified with the ownership of the stock. Austin Corbin, president of the Philadelphia and Reading Railroad, will be selected to fill the vacancy caused by the death of Harrison Durkee. The other names have not been fully decided upon. Russell Sage and other directors say that the changes do not foreshadow any alteration in the policy of the company or its relations to competing lines.

It is generally conceded that telegraph rates will never be put back to their former high basis, as the economies and improvements introduced have rendered those rates unnecessary. But there will be a restoration of rates at points where they have been unprofitable, when the opportunity offers. The company in the last year transmitted for the press 438,000,000 words, against 367,000,000 words in the previous year.

Making Use of a Classic Waterfall.

The celebrated waterfall of Teverone, which Horace calls "præceps Anio," has been employed to put in operation two dynamos of 100 horse-power for the illumination of the city of Tivoli. Others are being fitted up. The motive power, which is to be utilized by a company from the designs of M. Cantoni, is equivalent to several thousand horses. The illumination of Rome is contemplated, as well as the distribution of force to a distance from the station. The excavations and canals are conducted under the house of Mæcenas, which is described as situated at udum Tibur, now Tivoli.—*Nature.*

TELEGRAPHIC

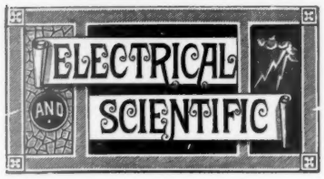
.... The Baltimore and Ohio Telegraph Company has brought suit against the Public Board of Trade of Dayton, O., for $500, which the plaintiff claims is due on a contract entered into in March last, by which the plaintiff was to place a wire in the office of the defendant in that city and furnish market reports. The plaintiff claims that the contract was carried out on their part, but that the defendant refuses to pay, although requested to do so.

.... The contractors in the employ of the Fire Department of Erie, Pa., have commenced the erection of poles at the corner of Sassafras and Twelfth streets, working their way westward on Twelfth. This is the start of extensive changes in the fire alarm system in the city, which, when completed, will result in a material improvement over the present system, and obviate crippling through the breaking of one wire. About 600 cedar poles will be set and 25 miles of wire strung.

.... The Great Northwestern Telegraph Company has notified the Montreal Telegraph Company, of whose lines it is lessee, that, owing to breach of contract, it will discontinue the payment to the latter of $165,000 per annum rental for its wires, equal to 8 per cent. on the capital stock. The claim is that the Montreal company should prevent the Canadian Pacific from absorbing the business over certain lines which were controlled by the Montreal company at the time the contract was made, but which the Canadian Pacific has since acquired control of by purchasing the railways over which they extend. This is regarded by the Montreal people as a subterfuge to break the contract, and a lawsuit will doubtless follow. The Great Northwestern is said to be controlled by the Western Union Telegraph Company.

.... A rule of a telegraph company requiring that a transient person sending a message calling for an answer shall deposit in advance an amount sufficient to pay for a reply of ten words is not unreasonable, according to the decision of the United States Circuit Court for the Western District of Tennessee in the case of Hewlett *vs.* the Western Union Telegraph Company. The court says: "It may be that a more liberal rule might be devised for transient persons and that this one operates sometimes harshly and inconveniently, but that is not the question. In view of the whole system, a court cannot say that the power and discretion of the company to determine for itself what is best for all concerned has been unreasonably exercised. It has a choice of its own regulations, and the test of reasonableness is not whether some other would answer its purposes as well or better, but whether this is fairly and generally beneficial to the company and all its customers."

.... There is no sign of yielding on either side in the ocean cable war. Both parties claim that they will keep up the struggle indefinitely. The Commercial Company asserts that the allied companies are wronging their shareholders by the suicidal rate of 12 cents a word, and that the public is standing by it, and paying it 25 cents a word, with the commendable object of defeating the allied companies in their effort to force a combination for extortionate prices. It is becoming evident, at least, that the allied companies will not succeed in raising the rate according to their original intention. Even if they should gain the monopoly, they would scarcely be so foolish as to insure new competition by gross overcharges. Though the situation is too well understood to permit of a return to the old method of abuse, it is just as well to sympatize with the Commercial Company and help it prevent the monopoly from being acquired. It has done the public a great service.—*New York World.*



* * A soldering fluid, composed of a teaspoonful of chloride of zinc dissolved in two ounces of alcohol, will not rust and tarnish, and has no bad smell.

* * An electric spark in a dusty atmosphere causes dust to settle, and, if the air be smoky, clears it. This is probably one reason why the air seems so clear after a thunder-storm, even if little rain has fallen.

* * Steel plates in the fire box, it is said, can be prevented from cracking by washing out with cold water after being blown out. Hot water will have a contrary effect and produce a crack.

* * Steam users have great respect for the engineer who gets more power from the coal than "the other engineer." It behooves working engineers to give this earnest and constant consideration. The man who "saves coal" is on the way to promotion and better pay.—*Stationary Engineer.*

* * During the last thunder shower a ball of the electric fluid descended and fell into a field of potatoes belonging to William White in Great Plain district. Within a circle of about fifteen feet in diameter the vines were burned as if by fire, and at the center of the circle the potatoes were uncovered and resembled baked potatoes.—*Danbury News.*

* * To cement wood and glass together, mix some finely-pulverized, well dried zinc-white with clear copal varnish, in such quantities as to produce a half-liquid preparation Spread this over the parts to be cemented, and it will be found that they will be jointed firmly together. This cement has the advantage over many others in that it does not injure the most brightly-polished oak wood, and will bear the test of washing with warm water.

* * Mr. Chas. Wann, of North Plainfield, has resigned his position with the "Telemeter Company, of New York," of which Mr. Erastus Wiman is President, to accept a more lucrative one with the "Union Fire Alarm Company," of No 145 Broadway, New York. He has been appointed General Agent and has a large field of operation to choose from, as the company has been organized with a view to supplying a simple and reliable system to such cities and towns as cannot afford to pay the prices demanded for other systems.

* * According to *Engineering*, a German chemist and metallurgist, Dr. Kesmann, strongly recommends the use of treacle for forming small coal and fine ore into solid briquettes, as first proposed by Saltery. A mixture of 1 to 1½ per cent. of treacle was sufficient to make coal dust of very lean Silesian coal into good solid blocks which gave a strong coke. Such blocks are also excellent for gas-making. In a similar manner blocks can be made of any powdery iron ore such as some magnetic ores and pyrites residues.

* * A Spanish shepherd killed by lightning recently was made the subject of a scientific post mortem to discover how the electric bolt had done its fatal work. His eyebrows and eyelashes were burned off, his eyeballs were dried up, all his left side was scorched and burned in spots down to the ankle, while the right side of the body and right leg were uninjured. Serious as these injuries were, none of them appeared sufficient to have caused his instant death. But as soon as the breast was opened the cause of death was apparent. The lungs were frightfully congested, and the heart was enormously dilated and filled with coagulated blood. With all this damage to the man his clothing was very little injured, the only traces of the lightning upon it being a small hole bored through the rim of the hat, and a slight singing of the shirt collar.

* * E. Otz & Co. have built a model silk mill on a large scale at West Hoboken. The mill is on the English plan, being of one story only, lighted by skylights in the day time, and a 500 light Westinghouse incandescent plant at night.

* * Thos. J. Keech, J. E. Beal, Edward Duffy, S. D. Taylor and Zina P. King, composing the Ann Arbor Electric Street Railway Company, have asked for a thirty-year franchise for the construction and operation of a street railway in that city. The consideration of the ordinance was postponed until a special meeting to be held next Monday evening. The company proposes to use an electric motor and establish a five-cent fare. If the franchise is granted three-fourths of a mile of railroad must be constructed and in operation within a year, to make the franchise operative. The capital stock of the company is $25,000, of which twenty-five per cent. is paid in.

* * The effect of lightning in vitrifying rocky material and producing what is known as lightning holes is made the subject of an interesting paper by Prof. Brun, published in the *Archives de Geneve*. He and other investigators have found these holes in the High Alps at heights of from 11,000 to 13,000 feet above the sea level. Usually they are found on summits. Sometimes the rocky mass which has been vitrified by the electric fluid presents the appearance of small scattered pearls, sometimes of a series of semi-spherical cavities only a few millimeters in diameter. Sometimes there are vitrified rays going out from a central point to a distance of four or five inches. Sometimes a block detached from the mass appears as if bored through by a cannon ball, the hollowed passage being quite vitrified. The thickness of this vitrified coating or stratum never exceeds a millimeter, and is sometimes not more than a quarter of that depth. The varying colors which it presents depend upon the qualities and composition of the rock. The same may be said of its transparency. On the Rungfischorn the glass formed by the lightning is black, owing to the quantity of actinolith which the rock contains. It is brown on La Ruinette, the rock consisting of feldspar mixed with gneiss containing chloride of iron. Under the microscope these lightning holes display many interior cavities, which must be attributed to the presence of water in the rock at the moment of melting by the electric discharge. This vitrified material has no influence upon polarized light.

The Voyage of the Volta.

A few days ago the electric boat Volta crossed from Calais to Dover and back again under the propulsion of power stored in secondary batteries. The double trip was made with a single charge, which proved amply sufficient for the purpose, and was in every way successful, although it is not very clear that it demonstrated anything more than could have been shown by a run in the Thames or the Solent. The boat passed the pierhead at Dover at 10.41 A.M., and made the pierhead at Calais at 2.32 P.M., the run having occupied 3 hours and 51 minutes. The return journey was made in 4 hours 23 minutes, the total running time being thus 8 hours 14 minutes. This is no great speed, far below the maximum of which the boat is capable, but it was necessary to economize the power in view of the possible contingencies which may arise. Three different speeds can be obtained by various groupings of the two Reckenzaun motors which are employed. These motors are both on the same shaft, which they drive direct. For the slow speed the motors are coupled in series, the current passing through them in succession, and driving them at about 600 revolutions per minute. For the medium speed only one motor is employed, while for the fast speed they are placed parallel, thus affording two circuits to the current. Under the last condition the speed of rotation is 1,000 per minute, and the brake horse-power 16. The motors drive a three-bladed screw, 20 inches in diameter, and 11 inch pitch, coupled direct to the main shaft. The motors measure together 3 feet 10 inches long, by 1 foot 9 inches wide, by 12½ inches high, over all. They weigh 730 pounds, and are worked by sixty-one E P.S. cells, weighing about 2 tons, and each giving one horse-power for one hour. On Monday the battery gave a current of 120 volts and 28 amperes, which was maintained constant until Dover was nearly reached on the return journey, when it had fallen to 24 amperes. The boat, which was designed and built by Mr. Skelton, of Millwall, measures 37 feet by 6 feet 10 inches. It carried a party of ten, among whom was Mr. Reckenzaun and Mr. Stephens, of the firm of Stephens, Smith & Co., who have supplied the machinery. The noticeable feature in this trip, as in all previous experiments with electric boats, was the perfect stillness of its passage through the water. It is remarkable, says London *Engineering*, that the wonderful superiority in this respect over the noisy puffing steam launch, should not already have led to the general use of this method of propulsion for purposes of pleasure.

The Brush Electric Light Company in Detroit to Have Larger Quarters.

The electric lighting business has grown very rapidly in Detroit during the past few years. Since the city commenced lighting the streets by electricity and numbers of large private enterprises have adopted the arc and incandescent lamp, the Brush electric light company has reached the utmost capacity of its premises on Third street. Some time ago the company recognized the fact that it was only a matter of a short time until the plant would have to be removed to larger quarters, and consequently the company decided to prepare plans for the new building.

In order to be fully abreast of the times Mr. W. W. Leggett and Mr. D. O. Page, of the company, took a trip of inspection to the principal electric light factories of the East. New York, Brooklyn, Boston, Portland, Me., Washington, Philadelphia, Baltimore, Pittsburgh, and Cleveland, were visited and plans of most of the establishments brought back, with notes of their virtues and defects. From these investigations, together with private plans of local authorities, it has been resolved to construct a new building and new machinery.

A lot on Foundry street, across Michigan avenue from the Detroit bridge and iron works, was purchased as the site. This lot is 150 by 350 feet, and was bought from Stephen Pratt.

In regard to the work Mr. Leggett said: "We intend to make this the most complete plant in the world. I think we've profited by our trip among the eastern cities, and I don't see why we should not make a complete success of it. William Scott & Co. have been given the plans of the building to make and are at present at work on them. I don't know exactly when they will be completed, but I think in about three or four weeks time. The building will be about 100 by 200 feet and two stories high, but as regards the internal planning the architects will see to that. The new plant will furnish arc lights and incandescent lights on arc circuits, and also motor power, just as our present plant does.

"We leave the old site partly because we are obnoxious to the neighborhood and partly because the premises are not large enough for our business."

—— George L. Converse, Jr., of Columbus, O., has made a proposition to light that city by electric light. He proposes to furnish the city with 250 electric arc lights, properly tested and of 2,000 candle power each, to be suspended at such street crossings or other places as the City Council may direct, and to be lighted all night for the sum of $103 per year for each light and $100 per year for each additional light above that number. He also agrees to do commercial lighting at the same cost. The city may reserve the right to purchase the plant at an advance of 15 per cent. above actual cost.

Neatness in the Electric Light Factory.

It was the noon hour at the Bromson-Huller Electric Light Company factory, and the men were discussing a new order directing them to place their oil rags at the end of the day in an iron box.

"It's all nonsense," said Oyle, the engineer. "This saponaceous combustion"—

"Spontaneous, you mean," interrupted Hahmer, the blacksmith.

"Well, no matter what you call it," rejoined Oyle, "I've left them round for years, and never had so much fire as to light my pipe."

"The reason you never had any fires from them," said Chizel, the apprentice, "is that you use only mineral oils, which are not so dangerous as some other kinds, and, besides, you leave your rags and waste spread out. The most dangerous is linseed oil; and rags, waste or shavings containing any of it are almost sure to catch fire without your doing anything to them, if they are only put in a heap. When linseed oil hardens it really burns up in part very slowly. In this slow burning some heat is produced. If your rags are laid out flat the heat will escape, but if they are in a heap the heat will be confined and increase, till the whole bursts into a blaze."

"What's that smoke?" exclaimed Oyle, pointing to a pile of painters rags.

The crowd ran quickly to the corner of the room and saw a pile of rags smoking and quite hot to the touch. All hands assisted in preventing a fire, and voted that the boss was right.

—— The Nashua Electric Light and Power Company, Nashua, N. H., have started up their station. They use the Thomson-Houston Company system of arc and incandescent lamps. Their station was equipped with steam power by the Jarvis Engineering Company of Boston, who furnished the Armington & Sims Company engine and steel boilers set with the Jarvis Patent Boiler Setting, and using Sheffield grate bars.

—— The Waltham (Mass) business men of the south side are seriously considering the desirability of putting in an incandescent electric light plant, and claim to have the promise of $2,000 income, with the prospect of double that amount. A meeting will occur the first of next week, at which the matter will be talked over and an agent of the Edison light will be present. These citizens are not satisfied with the action of the first electric company in consolidating with the gas company. They state that instead of getting the electric light at the same price as gas they are asked from twice to four times as much. The consolidated company will build a brick structure 45x40 feet, two stories high, with power and dynamos for 45 arc and 400 incandescent lights. The north side storekeepers have subscribed for a number of lights and the city is expected to take some, but poor success has been attained thus far on the south side.

—— In New Haven, the Electric Light Company is putting in additional machinery to run 1,000 new incandescent electric lights for residences and stores. The wires and lamps may be adjusted to ordinary gas fixtures or suspended from the ceiling. Each lamp is supplied with a switch, so that each light can be turned off at will. The wires are adjusted with ornamental fixtures, which are so arranged that the lights are within easy reach of a person standing on the floor. The lamps do not need renewing oftener than once in six months. All persons using the new lights are required to sign a contract for one year from November 1. The lights are made with 10, 16, 20, 24, 32, 64 and 120 candle power. The ten candle power are designed for stores, and when used from dark until 8 o'clock in the evening during the short days of the year, cost $1 per month each. Fifty cents additional will be charged for lights that are used until 10 o'clock or later. For lights that are used all night $1.75 is charged.

Digest of U. S. Patents on Storage Batteries.

REFERENCES TO FOREIGN PATENTS OBTAINED THEREON.

(TWELFTH PAPER.)

1884.

311,445. Jan. 27, 1885. Filed April 22, 1884.
French patent, No. 141,556, March 7, 1881.
English patent, No. 1,097, March 14, 1881.
Belgic patent, No. 54,393, April 15, 1881.
German patent, No. 16,818, April 27, 1881.
Spanish patent, No. 1,461, June 27, 1881.
Italian patent, No. 13,129, July 16, 1881.
Austrian-Hungarian patent Nos. 14,285 and 28,920, August 26, 1881.
Simon Phillippart Fils, Paris, France.

The electrodes are described as cups or vases of metal, with solid bottoms, so that they may serve to hold the exciting solution. A number of such cups or vases are nested together, that is, arranged one over the other, and connected in alternate series. The active material may be formed on the "Plante system," or be a mechanically applied porous layer of lead oxide.

312,599, Feb. 17, 1885. Filed Jan. 18, 1882.
J. Wilson Swan, London, England.

The plate which forms the support for the material active in the battery, is constructed with cells or cavities, which extend through the body of the plate.

The claim is for such a plate, with the active material, or material to become active, packed in said perforations or cells.

312,698, Feb. 24, 1885. Filed Feb. 27, 1884
Alex. H. Bauer, Baltimore, Md.

Relates to a system of charging storage batteries from a central station, and to the distribution of the current from batteries charged and located at such stations. Various details of circuits, switchboards, etc., are shown and described.

312,802, Feb. 24, 1885. Filed April 19, 1884.
Chas. S Bradley, Yonkers, N. Y.

Within and slightly above the bottom of a glass-containing vessel is placed a perforated carbon plate. At the top of the vessel a porous jar is suspended, containing a plate of zinc.

The electrolyte used in both vessels is a solution of zinc bromide. Upon the passage of the current in charging the zinc, bromide is decomposed—the zinc deposited upon the zinc plate and the bromide set free over the carbon plate which will be dissolved in the water of the solution until the water is saturated. The free bromide gravitating beneath the carbon plate. The discharge of the cell reverses the chemical actions.

312,058. March 3, 1885. April 23, 1884.
W. E. Case, Auburn, N. Y.

Describes an electrolytic solution normally containing zinc sulphate and aluminum hydrate.

314,892. March 31, 1885. Filed June 2, 1884.
Eli T. Starr, Philadelphia, Pa.

The battery plates are constructed of a series of parallel metal strips of **V** shaped cross section, the opening being at the top—and arranged one above the other to the desired height—and the whole surrounded by a metallic frame with a terminal lug on one side. The parallel strips are burned fast to the metal frame. The plates may be formed by the Plante process, or fine shavings or pieces of lead may be packed in the trough shaped spaces of the parallel strips.

315,339. April 7, 1885. Filed Dec. 15, 1882.
Edward T. Reichert, Philadelphia, Pa.

The electrodes consist of plates having attached to their sides and integral therewith a series of concave troughs adapted to be filled with any material active in the battery. Separable porous partitions are located between the plates.

315,340. April 7, 1885. Filed Dec. 15, 1882.
Edward T. Reichert, Philadelphia, Pa.

The electrodes consist of plain, corrugated or fibrinated plates perforated—and are located between porous partitions provided with shelves—which serve to support active material on plates, or can be packed with any readily oxidizable material to assist the "formation" of the electrodes in situ.

316,407. April 21, 1885. Filed Oct. 20, 1882.
W. A. Shaw, Brooklyn, New York.

The electrodes consist of a supporting body which may be a metal, metallic alloy or composition, as for instance, lead, lead and antimony, or lead antimony and tin, upon which is applied, while the supporting body is in a plastic condition, lead sponge, lead oxide or other material adapted to become active in the battery. The support and the material are united by pressure or other equivalent means. Such electrodes may be perforated and provided with a fibrous covering.

The claims are for the method of manufacture consisting of uniting the active material to the conducting support by welding or casting.

Various methods are described for accomplishing the same result.

—— The electric railway on Dix avenue, Detroit, is running daily, making regular trips.

—— Vincennes, Indiana, is rejoicing over its new electric light. The incandescent lamps are used for street lighting, being of 30 candle-power.

—— Lieut. Millis, the electrical expert at the Government station at Staten Island, has been given authority to arrange for the electric plant in the Bartholdi Statute. The exact power of the light has not been determined and will be decided after experiments to test the detracting force the mass of iron and bronze will have on the current of electricity. With Lieut. Millis at the head, the electrical work could not be in better hands.

—— Owing to certain matters in connection with the contract for lighting the Toledo Asylum for Insane, the Brush, Edison and Westinghouse lighting companies objected to the approval of the contract with the United States Company. The matter was argued before the Governor, Attorney-General and Auditor of State of Ohio, at Columbus, on Saturday last, and it was decided not to approve the contract with the United States Company, but to have the Asylum Board readvertise for bids. The Toledo Board will doubtless do this at once.

—— By means of electricity the most attractive leather surfaces are now completely imitated. The leather which it is desired to imitate is first well cleaned and coated with graphite, as in electro-plating a smaller article. It is then placed in a copper bath, the tank of which is made large enough to easily receive a skin of any size. A powerful dynamo-electric machine furbishes the current. The copper is deposited upon the coated surface of the hide to a thickness of one-sixteenth to one-eighth of an inch. The plate thus formed reproduces, but reversed, every mark and minute vein of the leather, so that a print taken from it is an exact copy of the original.

—— Sir James Douglass, engineer-in-chief to the Trinity House, who had charge of the series of experiments made by the British Government to determine the relative merits, both as regards efficiency and economy, of the three lighthouse illuminants, electricity, gas and mineral oil, gave the results reached by the committee in an address at the recent meeting of the British Association. It was found that for the ordinary requirements of lighthouse illumination, mineral oil is the most suitable and economical illuminant and that for salient headlands and places where a powerful light is required electricity offers the greatest advantages. The general result of photometric measurements of the three illuminants showed that the oil and gas lights are equally affected by atmospheric variations; that the electric light is absorbed more largely by fog and haze than either the oil or the gas light, and that all three are equally affected by rain.

—— The activity apparent among engine builders is evidence of increased prosperity and growth in industrial enterprises. It is reported that 600,000 horse-power was turned out and "set up" in the last twelve months.

—— Messrs Chas. A. Schieren & Co., of this city, have a fine display of their leather belting at the American Institute Fair, on Third avenue Their "Electric" bell is very popular with electric lighting companies.

—— The Waterhouse Electric Manufacturing Company, of Hartford, Conn., have issued a new catalogue, giving the result of some recent very satisfactory tests of their dynamo.

—— The Waltham Gaslight Company and the Waltham Electric Light Company have consolidated This is right in line with the movement now going on among illuminating companies to furnish both kinds of lighting.

—— An electric light fable: To the quiet village of Da-ma-rath there came a financier who convinced the people of their need of the Deighlite system of arc lights. An installation was made, and a recent graduate of the Institute of Pantology, the nephew of the president of the local company, was appointed electrician, Snodkins, by name. He set about using carbons with an inner core of dolomite, enclosed in an air-tight globe. That night the line inspector had to carry a lantern to find the arc lights, and Snodkins was granted a vacation *sine die*.

—— The Pittsburg depot, which is entirely lighted by the incandescent lamps of the Westinghouse Electric Company, is one of the attractive points for all visitors. A number of delegates to the Electric Light Convention were pleased observers of the effect of this light in that city.

—— An 80-foot electric light pole was raised in Elizabethtown, Dakota, and the following night a wag placed a common lantern on its top. The citizens gathered and an informal meeting was held. The electric light company was condemned and that particular light was pronounced a fraud. They were slow in discovering the imposition.

—— The Manchester Gas Light Company have set their poles, and are nearly ready to commence the furnishing of electric light under the name of the Ben Franklin Electric Light Company. The Board of Aldermen refused to give the electric light companies the monopoly of lighting the city for a term of years as against the gas company.

—— The Cambridge Electric Light Company, Cambridge Mass., has nearly completed their station situated in Cambridgeport, Mass They are setting two 125 horse-power boilers with the Jarvis patent boiler setting, and will use the Sheffield grate bars to burn screenings and fine coke for fuel.

—— A proposition has been made by the Thomson-Houston Electric Light Company to the lamp committee of the Common Council of Elmira, N. Y., to supersede the naphtha lamps now in use with incandescent lights. There are now 325 naphtha lamps, which cost seven cents per night, or about $5,460 per year. The electric light company claims that the lamps and poles of the naphtha lamps can be used, and better light furnished at less expense. The yearly contract for the naphtha lamps has expired, and the matter will probably be brought to the attention of the council at the next meeting.

—— The reduction of aluminium by means of the electric current, now carried on by the Cowles Company, of Cleveland, O., is not, says *Science*, effected by the voltaic arc, as is generally supposed. In the Cowles process, a connection is established between the carbon terminals through the medium of a mass of finely pulverized carbon and other materials, the terminals being drawn some distance apart after the circuit has been established. By this system the intense heat of the arc is modified, and diffused through a large area of minute particles, keeping them at a constant incandescent heat, thereby effecting the reduction of the most refractory materials.

ELECTRIC LIGHT NEWS

—— Twenty five additional arc lamps have been ordered of the Brush Company by the Albany, N. Y., Council.

—— The Massillon (Ohio) Schuyler Electric Light Company, with a capital stock of $25,000, has been incorporated.

—— Natchez, Miss., is considering the question of adopting the electric light. A local company will probably be formed.

—— A petition is being circulated in Trenton, N. J., asking the People's Electric Light Company to run the station day and night.

—— The city of Pawtucket, R. I., has voted for new electric lights, and the ordinance appropriating money for them has passed the city council.

—— The Edison Illuminating Company, Topeka, has ordered the Jarvis boiler setting for three boilers and will put in the National rocking grates to burn waste coal.

—— The Edison Company has 702 installations in the United States, aggregating 181,463 lamps, in daily use. All these are owned and operated by the purchasers.

—— The Westinghouse Electric Company have contracted with the El Paso Electric Light Company, Colorado Springs, for a central station plant, starting with 600 lights capacity.

—— The street light committee of San Francisco have recommended that two large electric masts and one small one be put up in South Francisco, a portion of the city greatly needing the light.

—— The torch of the statue of Liberty will contain five electric lamps of 30,000 candle power, the light of which will be thrown heavenward. It is believed that the light will so illuminate passing clouds that they will be visible at a distance of 100 miles. Four electric lights of 6,000 candle-power each will be placed at the foot of the statue, so as to illuminate it. The diadem on the head of the figure will contain incandescent lamps to give the effect of jewels.

—— Further experiments in the direction of lighting trains by electricity are reported from Glasgow, where an experimental train fitted with electric light has been run on the underground railway. The cost is about one-third as compared with gas. Each compartment of a carriage is provided with two incandescent lamps, each of sixteen candle-power. The contact is so arranged that only one lamp is lighted at a time, and, in the event of a breakage of the lamp in use, the other one is immediately lit up.

—— Applications for electric lights to be placed in various parts of the city of Providence, R. I., are continually being made by citizens. There are sections of the city where lights are greatly needed, but the number cannot be increased without the city council makes an additional appropriation. It is understood that a $300 appropriation will give about a dozen more lights for the remainder of the appropriation year, which expires November 30th.

—— The Consolidated Electric Light Company, of Portland, Me., took possession on Saturday of a lot of land forming a substantial addition to its real estate. About 20,000 square feet will be occupied by the increased station, which will be a two story building with 100 feet street front. The present steam capacity of 300 horse-power will be at once increased to 400 and perhaps to 500 horse-power, and it is expected that the Edison municipal system, which has been operated the past year in conjunction with the arc for street work, the lighting of the *Press* and *Argus* newspaper offices and the City Hall will soon be reinforced by the three-wire system for general commercial service and Sprague motors. Superintendent Sawyer is to be congratulated on these tangible results of three years of hard work.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING OCT. 5, 1886.

350,126 Electric fire extinguishing and alarm system; Joseph W. Frost, Rochester, N. Y.

350,130 Induction coil for telephone service; Evelyn B. Hamlin, Chicago, Ill.

350,140 Electric arc light; Geo. M. Lane, Asbury Park, N. J.

350,154 Belt controller for dynamo machines; Benjamin F. Radford, Hyde Park, Mass.

350,160 Telephonic apparatus; James W. See, Hamilton, Ohio.

350,177 Electric winding device for clocks; William F. Weisgerber and Ida C. Himmer, New York, N. Y., assignors by direct and mesne assignments to the Standard Electric Clock Company, same place.

350,203 Telephone attachment; John T. Lister, Cleveland, Ohio, assignor by direct and mesne assignments to James C. O'Neil and Chas. A. Dainz, both of same place.

350,215 Telephone transmitter; Frederick G. Sargent, Westford, Mass.

350,234 System of railway signaling; Thomas A. Edison, Menlo Park, N. J., and Ezra T. Gilliland, Boston, Mass., assignors to the Railway Telegraph and Telephone Company.

350,235 Railway telegraphy; Thomas A. Edison, Menlo Park, N. J., and Ezra T. Gilliland, Boston, Mass.

350,279 Electric water level indicator; Charles H. Wickersham, Pottstown, Pa.

350,299 Mode of electric communication; Amos E. Dolbear, Somerville, Mass., assignor by mesne assignments to the Dolbear Electric Telephone Company of New Jersey.

350,312 Door-catch adapted to be operated by electricity; William H. Markland, Brooklyn, N. Y., assignor to Tucker and Baxter, same place.

350,320 Autographic telegraphy; Jas. H. Robertson, Brooklyn, N. Y.

350,381 Automatic fire alarm; Adam Meisenheimer, Milwaukee, Wis.

350,388 Detector for marsh and other hydrocarbon gases; Nelson W. Perry, Norwood, assignor of one-half to Herman John Groesbeck, Cincinnati, Ohio.

350,411 Automatic circuit-closer for railway signals; William Buck, Kilburn, county of Middlesex, England.

350,426 Automatic electric fire alarm system; Joseph W. Frost and Stephen D. Lake, Rochester, N. Y.

350,430 Electric time indicating system; Charles A. Hussey, New York, N. Y.

350,431 Primary electric clock; Charles A. Hussey, New York, N. Y.

350,432 Electric time indicating system; Charles A. Hussey, New York, N. Y.

350,433 Secondary electric clock; Charles A. Hussey, New York, N. Y.

350,434 Electric time indicating system; Charles A. Hussey, New York, N. Y.

350,435 Case for secondary electric clocks; Charles A. Hussey, New York, N. Y.

350,449 Annunciator; Charles A. Tucker, Islip, assignor to Tucker and Baxter, Brooklyn, N. Y.

350,450 Case for medicine bottles; Charles A. Tucker, Islip, assignor to Tucker and Baxter, Brooklyn, N. Y.

350,469 Printing telegraph; D. Bryce Scott, Brooklyn, N. Y., assignor to the Western Union Telegraph Company, of New York.

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Fig.259

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Fig.255

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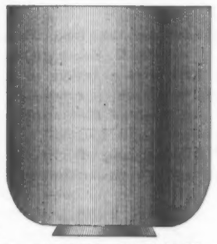

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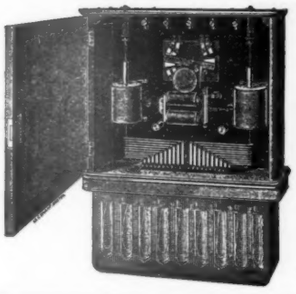

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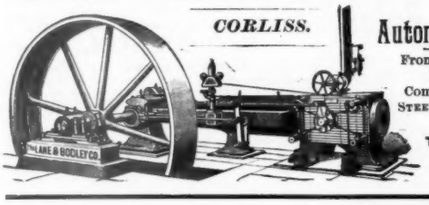

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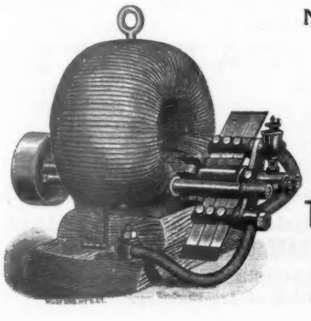

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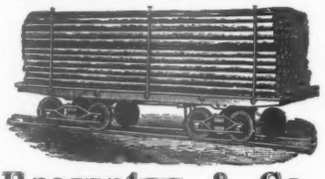

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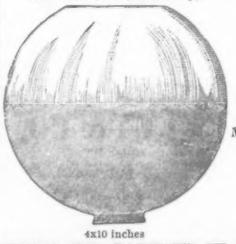

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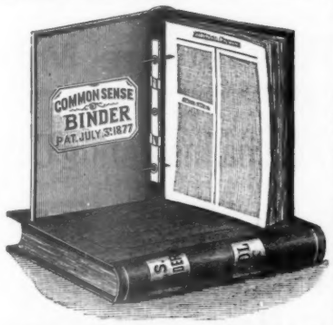

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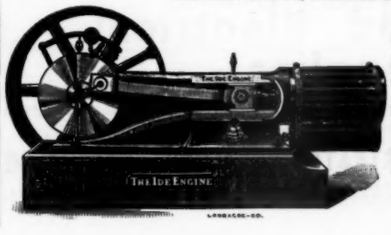

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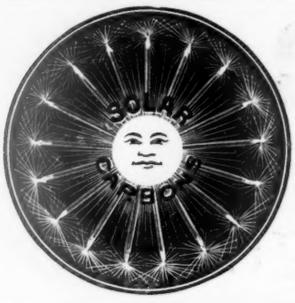

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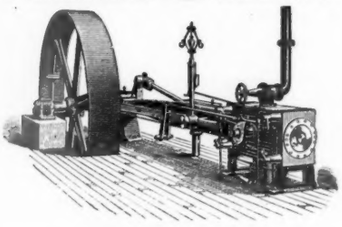

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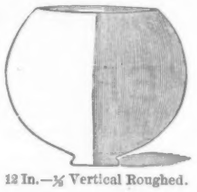

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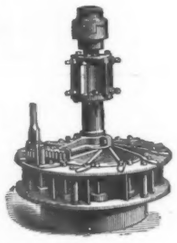

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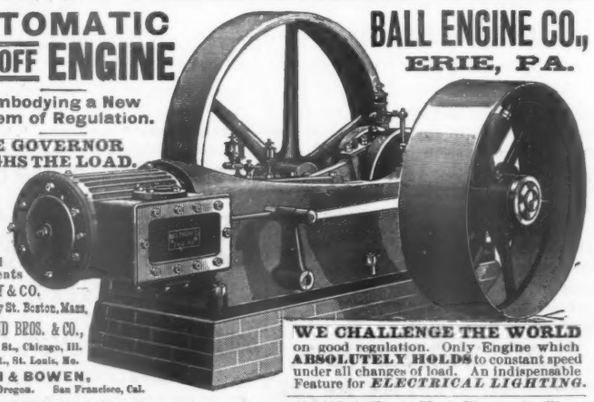

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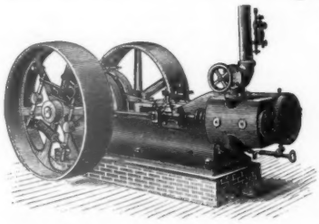

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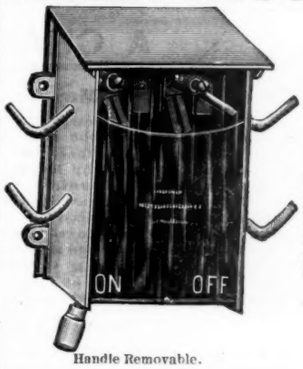

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This system of Electric Lighting is the development of a series of inventions and discoveries of James J. Wood, Electrician of the American Electric Manufacturing Company, of New York, who has devoted himself to the discovery of new and original methods by which **an improved system of arc lighting,** with perfect automatic regulation, superior in electrical efficiency, more economical in construction and operation than other systems, could be obtained.

Mr. Wood has succeeded in his efforts, and has produced a Dynamo-Electric Machine, manufactured in various sizes, with capacity of 1 to 50 lights of 2,000 candle-power each, which is superior to any Dynamo Electric Machine ever before invented, and which stands **the severest tests to which such machines can be subjected.**

Mr. Wood has also invented a set of **Lamps** which are **perfect** in their electrical and mechanical construction. In operation they are **free from hissing and frying noises,** and do not **cut out of circuit,** or allow the **carbons to slip by** and extinguish the light—defects so objectionable in other systems.

☞ The AMERICAN COMPANY cordially **invites investigation of its System by Scientists, Electricians and Mechanicians,** as well as by all who contemplate buying or using Electric Light Apparatus.

THE SPECIAL ADVANTAGES

claimed for the AMERICAN SYSTEM of Arc Lighting are

THE MOST PERFECT IN PRINCIPLES OF ELECTRICAL AND MECHANICAL CONSTRUCTION.

For **Completeness** and **Simplicity** of construction, **Durability** and **Economy** in operation, **Steadiness** and **Quality of Light** produced, and **Perfection in Automatic Regulation,**

IT HAS NO EQUAL.

The *Wood Automatic Regulator* is Entirely Original, Absolutely Perfect in Operation, and is the **Only Perfect Automatic Current Regulator** ever invented, the pretensions of rival companies to the contrary notwithstanding.

The Wood Automatic Regulator is the **only one** made which will permit the turning on and off of all the lights in circuit and allow the dynamo to **run any length of time on a short circuit,** or any number of Lamps—from one upward—on any size or capacity of machine without injury to the machine, and with corresponding diminution of power.

The cost of oil and Commutator Brushes is **reduced to a Minimum,** one set of Brushes lasting for months without readjustment.

The general care and expense of running and maintenance of the American Machine and Lamp is **far less than in any other system.**

The **absolute safety** of Armatures **from burning** (the great difficulty with other systems, and which makes maintenance so expensive), is a feature of incalculable value in the American apparatus.

The Wood Armature is now so constructed that it is **impossible for it to burn out, or for copper or other metallic dust to collect on it, to form a short circuit,** while the powerful circulation of air through the armature is not interfered with.

The Field Magnets are constructed so that it is impossible to form a short circuit that will burn them, or in any way affect the light.

The American generator occupies less space, weighs less, and requires less motive power than any other capable of producing an equal number of lights.

There is no flashing or firing of the commutator, and consequently no loss of energy and wearing of the parts from this cause. Its commutator requires no oiling, air blasts, or other attention than to be kept clean. Its extreme simplicity enables it to be operated with less skill and attention than are required by other systems.

The foregoing are bold statements, and we are ready to substantiate them in every particular. Comparison and competitive tests with other systems of Electric Lighting is invited. We stand ready to meet any known system of Electric Arc Lighting in open and fair competitive tests, upon all points of superiority claimed for our apparatus, wherever and whenever a sale is guaranteed to the winner in the contest.

☞ ***Local Electric Lighting, or Gas Companies, either New or Old, should INVESTIGATE THE AMERICAN SYSTEM before buying New Apparatus elsewhere.***

A CHALLENGE.

To All Whom it May Concern:

The American Electric Manufacturing Company only makes such claims regarding the superior merits of the American System as its officers are convinced can be fully maintained in open and fair competition with any known system of Electric Arc Lighting manufactured in this country.

With a view to having this question fairly, definitely and authoritatively settled between the various manufacturing Electric Light Companies now in the market (all of whom make statements regarding their respective apparatus which are, and always will be, more or less misleading to intending purchasers until full and complete tests are made and the results published to the world), the American Company hereby offers the following

CHALLENGE

to any and all manufacturing Companies of Electric Arc Light Apparatus in this country, to meet in a 30 days' competitive test, in all the points of superiority claimed for the American (Wood) Dynamo Machine and Lamp.

Each Company entering for the test to deposit the sum of $1,000 cash, in such bank as may be mutually agreed upon by the contestants, as an entry or admission fee, for the following purposes, viz:

1st.—Defraying the expenses of the test.

2d.—The Balance to belong to the winning company, which shall immediately donate it to the Charleston Sufferers.

This challenge is made to all Manufacturing or Parent Companies of Electric Arc Light Apparatus in the United States, but is made with especial reference to the Thomson-Houston Electric Company, of Boston, Mass. This challenge is open for 30 days, from October 1st, 1886, at the end of which time a representative of the American Company will meet the representatives of such other companies as signify to us their acceptance of this challenge, for the purpose of arranging time, place and details for the competitive test.

AMERICAN ELECTRIC MANUFACTURING CO.,

NEW YORK, October 1st, 1886. By EDWARDS H. GOFF, *Pres't and Gen'l Manager.*

Special Attention given to installing Isolated Plants for Mills, Factories, Shops, Railroad Buildings, and other Buildings where large spaces are to be illuminated.

Estimates Furnished for building Complete Central Lighting Stations of any capacity for Electric Lighting alone, or for **Electric Lighting, combined with established or prospective Gas Plants.**

A COMBINATION ELECTRIC LIGHT and GAS PLANT is sensible and business-like. Some of the most prosperous and progressive Gas Companies in the world have successfully adopted this plan with the inevitable result of a much more profitable business, as well as making the gas company much more popular with its customers.

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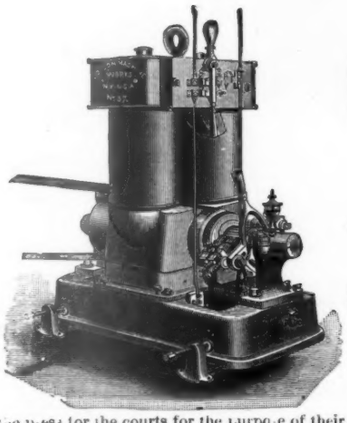
EDISON LIGHT!

THE ONLY PERFECT SYSTEM of ELECTRIC LIGHTING.

MORE THAN 300,000 LAMPS IN USE.



Estimates for Central Station or Isolated Plants furnished on application.

EDISON COMPANY, for ISOLATED LIGHTING,

16 and 18 BROAD ST., NEW YORK.

The Incandescent Electric Lamp is the universally acknowledged invention of Thomas Alva Edison, and is covered by fundamental patents granted to him January 27, 1880, No. 223,898; May 4, 1880, No. 227,229; and July 20, 1880, No. 230,255.

These patents, as well as some 300 additional detail and system patents, are all owned by this company.

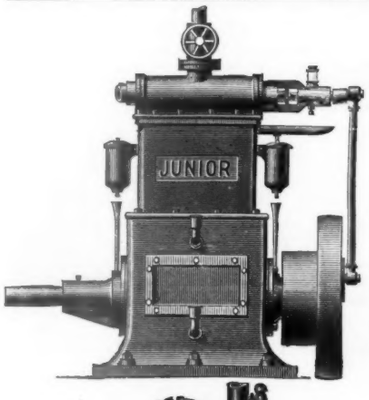
All forms of incandescent lamps as well as a great majority of the "Detail" and "System" devices offered by others than this company and its licensees, infringe the above mentioned patents, and all persons using them render themselves individually responsible for such unlawful use, and all the consequences thereof, and liable to suit therefor.

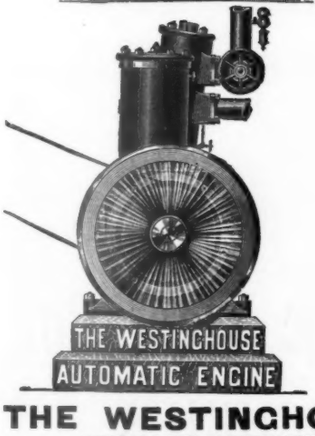
A CARD TO THE PUBLIC.

The Edison Electric Light Company having instituted suits on its patents, must decline to substitute the advertising columns of the press for the courts for the purpose of their legal interpretation. Mr. Edison's carbon filament patent of 1879 covers broadly the modern incandescent lamp. The claim that this patent has ever been in litigation in the United States Patent Office is absolutely false. In Germany and England, this fundamental patent has finally prevailed against all infringers thus establishing the fact that Mr. Edison's great invention has been nowhere anticipated; *Ergo*, a like result must follow in the United States. The straining and distorting of these facts, together with the violent effort to interweave with them certain minor and IRRELEVANT CASES for the purpose of fraudulently posing before the public as joint heirs with Mr. Edison in the fruits of these patent decisions, only indicate the DIRE EXTREMITY of those who are thus gradually becoming ENVIRONED by due process of law.

THE EDISON ELECTRIC LIGHT COMPANY

By EDWARD H. JOHNSON, Vice-President.





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The First Reduction is now in effect, and others will follow as results warrant. All our Latest Improvements are in force.

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THE WESTINGHOUSE ELECTRIC COMPANY of Pittsburgh, Is Conceded to Manufacture

"THE GILT EDGED" INCANDESCENT SYSTEM. Elegant details for Isolated Plants. Trained Engineers in Steam and Electrical Departments. Undivided Responsibility. **THE CONSTRUCTION OF CENTRAL STATIONS** is our special field, in which we are far in advance of all competition. Capital Investing for Dividends will do well to close no Contracts until our System is investigated and our Proposals considered.

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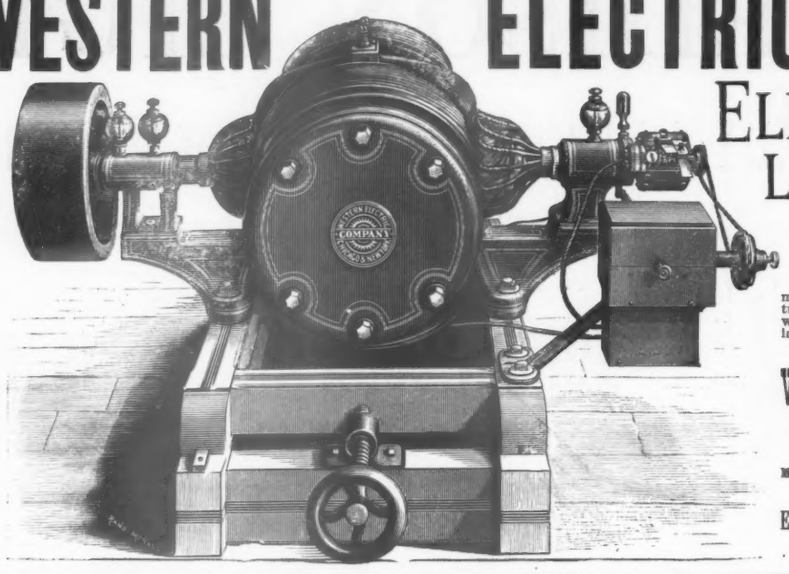

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Automatic, Self-Regulating System of Electric Arc-Lighting in the World

In all desirable qualities of ELECTRIC ARC-LIGHTS, the Thomson-Houston System has no equal. The Lights are *superior in color and steadiness*, and the entire apparatus is more *economical, efficient* and *safe*, more *easily managed*, and *less liable to derangement* than any other.

The Thomson-Houston Electric Company

was awarded the FIRST PRIZE for the *best system* of Arc-Lighting, and the *best Arc Lamp*, at the Cincinnati Industrial Exposition of 1883.

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New Illustrated Pamphlet will be sent on application.

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The Roberts Dry Battery, and the Well-known Permanganate Battery.

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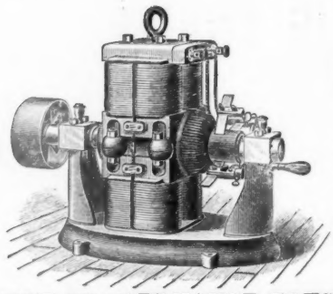

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A 50 H. P. Engine, same as is furnished to run 50 full arc lights of other systems, will operate at its MOST ECONOMICAL POINT of cut-off

90 FULL ARC WATERHOUSE LIGHTS.

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Only Manufacturers using Natural Gas, thus securing

Uniformity, Durability & Superior Light.

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Combines High Electrical Conductivity and Resistance to Corrosion with Lightness and Tenacity.

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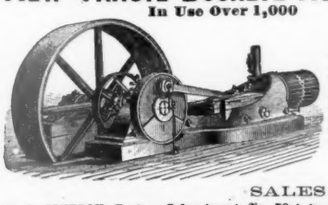

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The most perfect system of both Incandescent and Arc Lighting. Entire freedom from hissing and flickering in our Arc Lights, and long life and great brilliancy in our Incandescent Lights.

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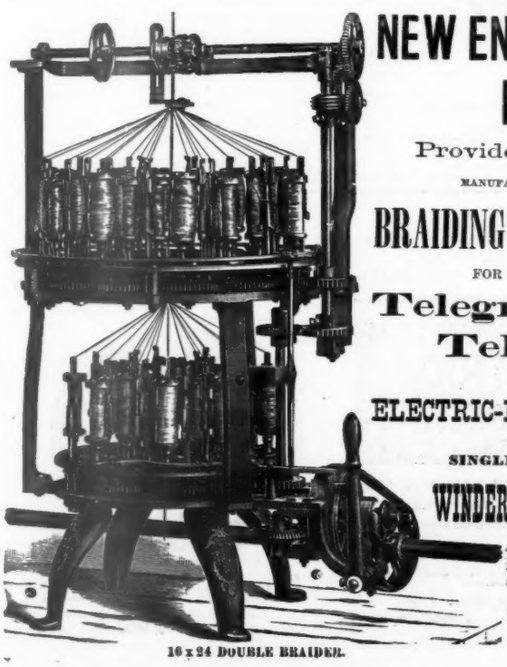

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YET DEVISED FOR THIS PURPOSE.

The COST of Installation is GREATLY Reduced and LONG DISTANCE Lighting Successfully Accomplished, from a COMMERCIAL STANDPOINT.

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The attention of TELEPHONE MANAGERS is especially asked to our ANTI-INDUCTION TELEPHONE CABLES, they being the most practical and durable in the market.

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THE FIRST MACHINES MADE ARE STILL IN DAILY OPERATION.

THE SYSTEM COMPRISES: { Arc Lights of various Sizes. Arc and Incandescent Lights from one Dynamo and Circuit. Incandescent Lights of various Sizes from Special Dynamo for Central Station Lighting.

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Machines for Arc Lighting, giving lights of 1,200, 2,000, 3,000, 4,000, and up to 100,00 candle power. Our No. 8 machine gives 65 lights of 2,000 c. p. with about 45 H. P.

Over twenty different styles of arc lamps, for indoor and outdoor use, and for tower lighting.

MACHINES FOR INCANDESCENCE LIGHTING,

adapted for use with Swan Incandescence lamps. These machines are automatic and do not require the use of any switches or resistances outside of the machine to govern the current. Will run any number of lamps from one up to the full capacity of the machine, without change of speed and without the use of any apparatus outside of the machine.

Our prices are lower than other makers.

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